



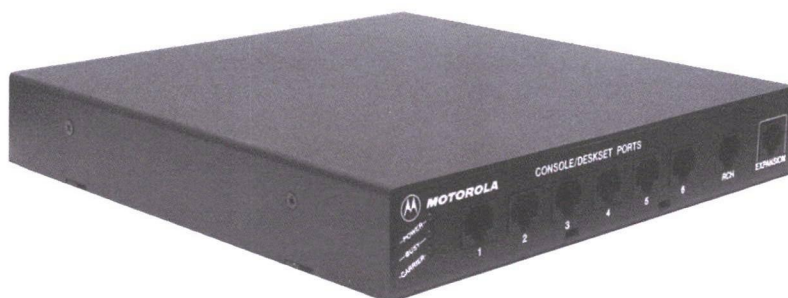
**MOTOROLA**

# Digital Junction Box

L3208, L3239

## Installation and Troubleshooting Manual

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6880309K29-E  
29 September 2005

## COMMERCIAL WARRANTY

### (STANDARD)

Motorola radio communications products are warranted to be free from defects in material and workmanship for a period of ONE (1) YEAR, [except for crystals and channel elements which are warranted for a period of ten (10) years] from the date of shipment. Parts, including crystals and channel elements, will be replaced free of charge for the full warranty period but the labor to replace defective parts will only be provided for ONE (1) Year from the date of shipment. Thereafter purchaser must pay for the labor involved in repairing the product or replacing the parts at the prevailing rates together with any transportation charges to or from the place where warranty service is provided. This express warranty is extended by Motorola Communications and Electronics, Inc., 1301 E. Algonquin Road, Schaumburg, Illinois 60196, to the original purchaser only, and only to those purchasing for purpose of leasing or solely for commercial, industrial, or governmental use.

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In the event of a defect, malfunction or failure to conform to specifications established by seller, or if appropriate, to specifications accepted by Seller in writing, during the period shown, Motorola, at its option, will either repair or replace the product or refund the purchase price thereof, and such action on the part of Motorola shall be the full extent of Motorola's liability hereunder.

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This warranty applies only within the United States.

### WARNING

This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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29 September 2005

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# Chapter 1

## Introduction to this Manual

### About this Manual

The purpose of this manual is to help you install and troubleshoot the Digital Junction Box. It is written for technicians who are responsible for the installation and troubleshooting of a radio system. It provides reference information for technicians and Motorola field support engineers and technicians.

This manual details generic installation techniques to install a Digital Junction Box and troubleshoot it rapidly. This manual assumes that you are familiar with the tools, test equipment, the system architecture, and the configuration of your system.

### Digital Junction Box Overview

There are two types of Digital Junction Box available:

- The L3208 Digital Junction Box connects CommandSTAR Lite consoles and/or MC3000 desksets and/or MCC 5500 consoles to one of the following types of Motorola radio:
  - Consolette, including:
    - ASTRO Spectra Consolette W9
    - ASTRO Spectra Plus Consolette W9
    - XTL 5000 Consolette
  - MCS 2000 (model III)
- The L3208 Digital Junction Box also connects *MCC 5500 consoles only* to the following type of Motorola radio:
  - MTM700 (Dimetra)
- The L3239 Digital Junction Box connects CommandSTAR Lite consoles and/or MC3000 desksets and/or MCC 5500 consoles to the following type of Motorola radio:
  - CDM1550 series (LTR), including:
    - CDM1550 LS
    - CDM1550 LS+

Up to six operator consoles and/or desksets can connect to a single digital radio through a Digital Junction Box. Up to six Digital Junction Boxes can be connected together, enabling a maximum of 31 consoles and/or desksets to share access to a single radio. A Digital Junction Box that connects directly to the radio with the supplied radio interface cable is referred to as the Master Digital Junction Box. For a single connection, the Master Digital Junction Box is the only Digital Junction Box in the configuration.



No additional operations need to be performed at the Digital Junction Box once it is installed, apart from routine maintenance checks. All radio operations are managed from the operator consoles and desksets.

**Note:** The Digital Junction Box (L3208) default configuration is for a Consolette radio. Refer to “Jumper Settings” in Chapter 2 if you connect the deskset to a different radio type.

## Model Information

Table 1-1 gives the model information for the Digital Junction Box, including optional equipment, field installation kits and accessories.

**Table 1-1: Digital Junction Box model chart**

Product	Part Number
Digital Junction Box (MCS/MTM700/Consolette)	L3208
Digital Junction Box (CDM1550 series — LTR)	L3239
<b>Options</b>	
MCS cable	ZA00224AA
MTM700 cable kit (Dimetra)	DDN8244A
Consolette cable	ZA00225AA
Two-wire Dial-up Modem	ZA00278AA
Two-/Four-wire Leased Line Modem	ZA00277AA
<b>Field Installation Kits/Accessories</b>	
120/240VAC 50/60Hz power supply	DDN6334
MCS 2000 radio interface cable	HKN6123
ASTRO Digital Spectra radio interface cable	DDN6333
Punch Block Cable (15 ft [4.6 m])	CDN6300B
Punch Block Cable (50 ft [15.24 m])	CDN6301B
Punch Block Cable (100 ft [30.48 m])	CDN6302B
Punch Block	DDN6481
Rackmount shelf and bracket	DDN6335
CDM1550 Remote Kit	RLN4802
CDM1550 Remote Kit Cable (10 ft [3.05 m])	RKN4077
Two-wire Dial-up Modem	DDN6660A
Two-/Four-wire Leased Line Modem	DDN6659A
MTM700 Remote Kit and Cable (10 ft [3.05 m])	DDN8244A

## Specifications

Table 1-2 gives the operating specifications for the Digital Junction Box.

**Table 1-2: Digital Junction Box operating specifications**

Condition	Specification
Audio Distortion	Less than 3% THD (total harmonic distortion)
Audio Transmit	0.78 VAC nominal
Audio Receive	0.78 VAC nominal
Data Interface	RS-485 standard
Frequency Response	+/- 3db from 300-3000 Hz @ 1 kHz ref.
Hum and Noise	Less than -45dB below rated outputs
Humidity	95% at 122°F (50°C)
Maximum distance between Master Digital Junction Box and console/deskset	5000 ft (1524 m) for two or more consoles/ 2000 ft (610 m) for a single console (50 ft [15.24 m] for RCH 3000)
Maximum distance to digital radio	50 ft (15.24 m)
Power input	10.5 to 16 VDC maximum
Temperature range	32°F to 122°F (0°C to 50°C)

Specifications subject to change without notice.

## Safety Summary

The following general safety precautions must be observed during all phases of operation, service and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the product. Motorola assumes no liability for the customer's failure to comply with these requirements.

### Ground the Equipment

To minimize shock hazard, the Digital Junction Box must be connected to an electrical ground. The equipment is supplied with a three-conductor AC power cable. This power cable must be plugged into an approved three-contact electrical outlet with the grounding wire (green) firmly connected to an electrical ground at the power outlet. The power cables meet International Electrotechnical Commission (IEC) safety standards. The chassis ground lead must be connected to the site ground.

## **Keep Away from Live Circuits**

Operating personnel must not open the Digital Junction Box. Component replacement and any internal adjustments that are required must be made by qualified maintenance personnel. Do not replace components with the power cable connected. To avoid injuries, always disconnect the power and discharge the circuits before removing equipment shelves or making major modifications.

## **Do Not Service or Adjust Alone**

Do not attempt major component replacement or any internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

## **Replacement of Plug-in Modules**

Replacement of plug-in circuit modules in the Digital Junction Box may be made without powering down of the system. However, only qualified maintenance personnel should do this task.

## **Electrostatic Discharge: Sensitive Parts**

This product contains CMOS and other circuit components which may be damaged by electrostatic discharge. You must take proper precaution when handling circuit modules. As a minimum, you should use grounded wrist straps at all times when handling circuit modules.

## **Do Not Substitute Parts or Modify the Product**

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Contact an authorized Sales and Service Office for service and repairs to ensure that safety features are maintained.

## **Contact Address for Service and Repairs**

If you experience trouble with this equipment (Digital Junction Box or modem), for repairs, warranty information or RA (Return Authorization) numbers, please contact:

Motorola Inc.  
System Support Center  
(800) 221-7144  
(847) 576-7300



## Dangerous Procedure Warnings

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. The warnings contain instructions that must be followed.

**WARNING: THE VOLTAGES EMPLOYED IN THIS EQUIPMENT ARE SUFFICIENTLY HIGH TO ENDANGER HUMAN LIFE. EVERY REASONABLE PRECAUTION HAS BEEN OBSERVED IN DESIGN TO SAFEGUARD THE OPERATING PERSONNEL. OPERATING PERSONNEL SHOULD BE PROHIBITED FROM TAMPERING WITH PROTECTIVE DEVICES SUCH AS DOOR SWITCHES. THE POWER SHOULD BE REMOVED COMPLETELY AND THE HIGH VOLTAGE CAPACITORS IN POWER SUPPLIES DISCHARGED MANUALLY WITH A SHORTING BAR BEFORE MAKING INTERNAL ADJUSTMENTS.**

## Electrical Safety Advisory

Because of the risk of electrical surges, typically lightning transients, which are very destructive to customer terminal equipment connected to AC power sources, we recommend that the customer should install an AC surge arrestor in the AC outlet to which the Digital Junction Box is connected.

## Electrostatic Discharge (ESD)

All objects, including the human body, collect charge due to air movement, friction or electrical fields. The charge collected results in a voltage difference between itself and other objects from which it is insulated. Connecting charged objects together may result in a flow of current between the objects until they are all at the same voltage. This process is referred to as electrostatic discharge (ESD).

ESD currents can damage electronic components. With large structures and charges, ESD can be dangerous for humans. You prevent a charge build-up by connecting objects together with a conducting path, keeping all the objects at the same voltage potential. The conducting path is usually a ground path. When packaging, installing or when handling electronic modules, the personnel involved must be connected to ground with an ESD strap.

See Section 11.9 of the *Motorola R56—Standards and Guidelines for Communications Sites* for more detailed information.

## Caring for the Environment by Recycling

This symbol on a Motorola product means the product should not be disposed of with household or business waste.



## Disposal of your Motorola Digital Junction Box

Do not dispose of Digital Junction Boxes or related electrical equipment, such as desksets, consoles, microphones or headsets, with household or business waste. In some countries or regions, collection systems have been set up to handle waste electrical and electronic items. Please contact your regional authorities for more details. If no suitable scheme exists, you may return unwanted console components and electrical accessories to any Motorola Approved Service Centre in your region.

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## Chapter 2 Installation

### Introduction

This chapter provides an overview of typical Digital Junction Box installation configurations, and explains the procedures to follow when installing a Digital Junction Box, connecting it to a radio and other equipment.

**Note:** The Digital Junction Box (L3208) default configuration is for a Console radio. Refer to “Jumper Settings” on page 2-12, if you connect the deskset to a different radio type.

### Overview

This section provides an overview of the following topics:

- Typical Digital Junction Box installation configurations.
- The sequence of procedures to follow when installing a Digital Junction Box.
- The physical layout of the Digital Junction Box, including the front panel, the back panel, the base and cover, and how to remove the cover.

### Examples of Typical Configurations

One or more Digital Junction Boxes can connect to one another and to a radio in a variety of ways. This section gives the following examples of some typical configurations:

- A single connection between a Digital Junction Box and a radio.
- A connection between multiple Digital Junction Boxes and a single radio.

**Note:** Specific configurations vary from site to site. These configurations are given as examples only. The descriptions below offer general installation guidelines; subsequent sections in this chapter provide detailed installation instructions.

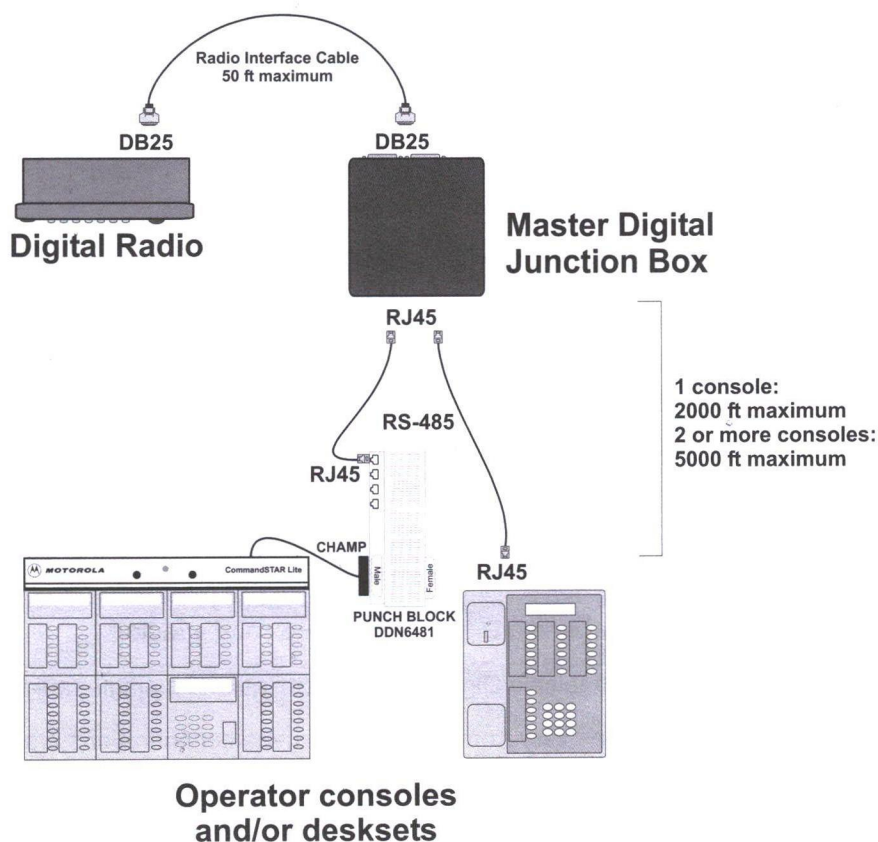


## Level Set Up for Consoles and MC3000 Desksets

During the installation, ensure that the output level (Tx) of the CommandSTAR Lite or MCC 5500 Dispatch Console is at -20dbm and the MC3000 deskset output level is at 80mV<sub>RMS</sub>.

### Single Digital Junction Box Connection

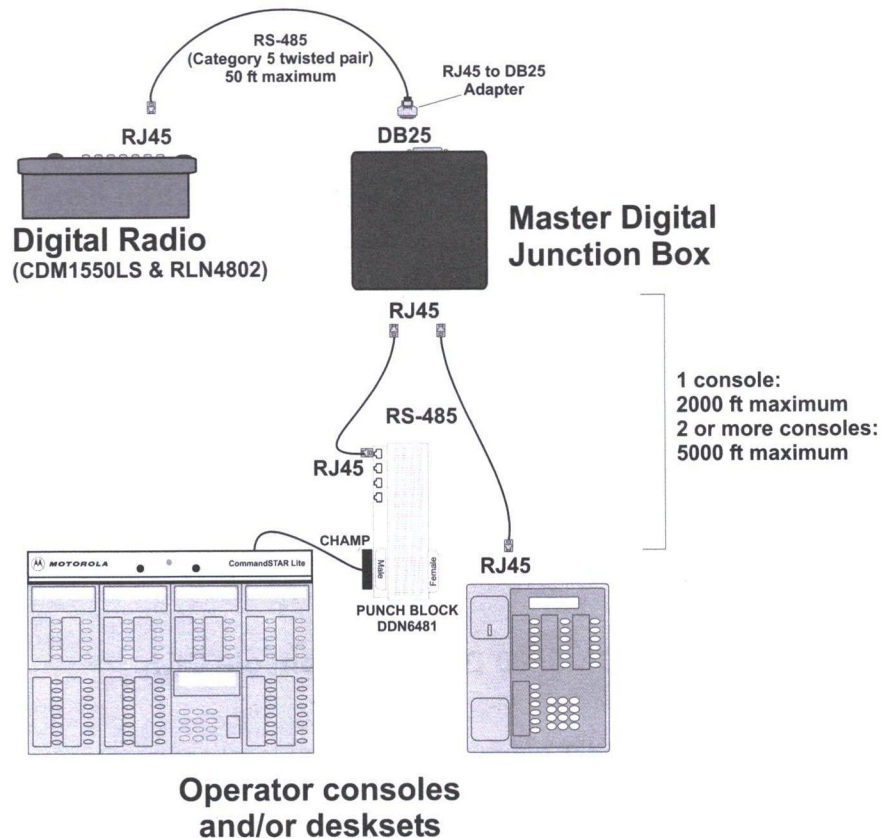
The Master Digital Junction Box is the Digital Junction Box that connects directly to the radio with the supplied radio interface cable. Figure 2-1 shows that the Master Digital Junction Box must be within 50 ft (15.24 m) of the radio. For a single connection, the Master Digital Junction Box is the only Digital Junction Box in the configuration. The connections to the operator desksets and consoles must not exceed 5000 ft (1524 m) for two or more consoles/desksets, or 2000 ft (610 m) for a single console or deskset. You make the connections to the Master Digital Junction Box using RS-485 links with RJ45 connectors. The radio in Figure 2-1 is either an MCS or Consolette radio.



**Figure 2-1: Digital Junction Box (L3208) local connection to digital radio**

**Note:** For a list of cables to use for the Radio Interface Cable between the digital radio and the Digital Junction Box, refer to Table 1-1, "Digital Junction Box model chart," on page 1-2 and use the appropriate cable type for the appropriate radio.

Figure 2-2 shows a single CDM1550 series (LTR) Digital Junction Box connection. You use a Category 5 twisted pair cable to connect the Master Digital Junction Box to the CDM1550 series digital radio. You make the connection at the front of the CDM1550 series radio with an RJ45 connector (remote adapter kit for the radio RLN4802) while at the Master Digital Junction Box an RJ45 to DB25 adapter (3210761) is used. The cable RKN4077 (10 ft.) can be used to join the two together. Use this same connection between the CDM1550 series radio and Master Digital Junction Box in Figure 2-4 when using a CDM1550 series radio in a multiple Digital Junction Box connection configuration.



**Figure 2-2: CDM1550 series Digital Junction Box (L3239) local connection to digital radio**

Figure 2-3 shows a single MTM700 (Dimetra) Digital Junction Box connection. You use an RJ45 cable no longer than 50 ft (15.24 m) connected on either end with an RJ45 to DB25 connection adapter at each end (3210866 and 3210867). You make the connection to the MTM700 (Dimetra) radio through the radio expansion head attached to the radio unit while connecting the other end to the back of the Master Digital Junction Box.

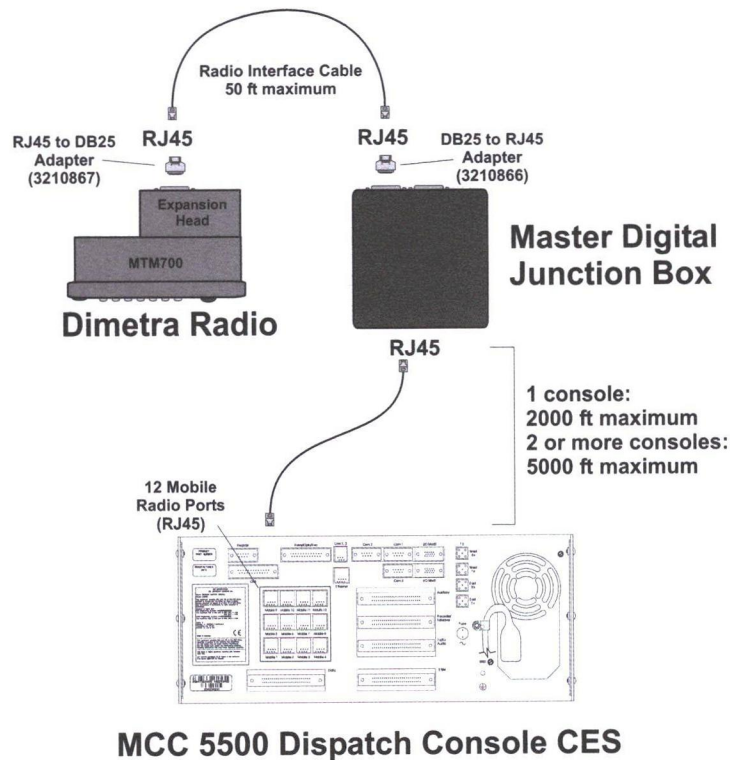


Figure 2-3: MTM700 Digital Junction Box (L3208) local connection to digital radio



## Multiple Digital Junction Box Connections

Multiple Digital Junction Boxes can share access to a single radio. You directly connect the radio (within 50 ft [15.24 m]) to one Digital Junction Box, referred to as the Master Digital Junction Box. You connect the Master Digital Junction Box to a second Digital Junction Box, which may be connected in turn to a third Digital Junction Box, and so on, for a maximum of six Digital Junction Boxes connected to up to 31 consoles and/or desksets. A Digital Junction Box placed after the Master is not connected directly to the radio and is referred to as a Slave. The Digital Junction Box connections use RS-485 links with a maximum total distance of 5000 ft (1524 m) between the consoles or desksets and the Master Digital Junction Box. Figure 2-4 shows two Digital Junction Boxes connected in this way, where all the cables in A and B together are less than or equal to the allowed maximum of 5000 ft (1524 m). For a CDM1550 (LTR) series radio, use the connection between the digital radio and the Master Digital Junction Box as shown in Figure 2-2

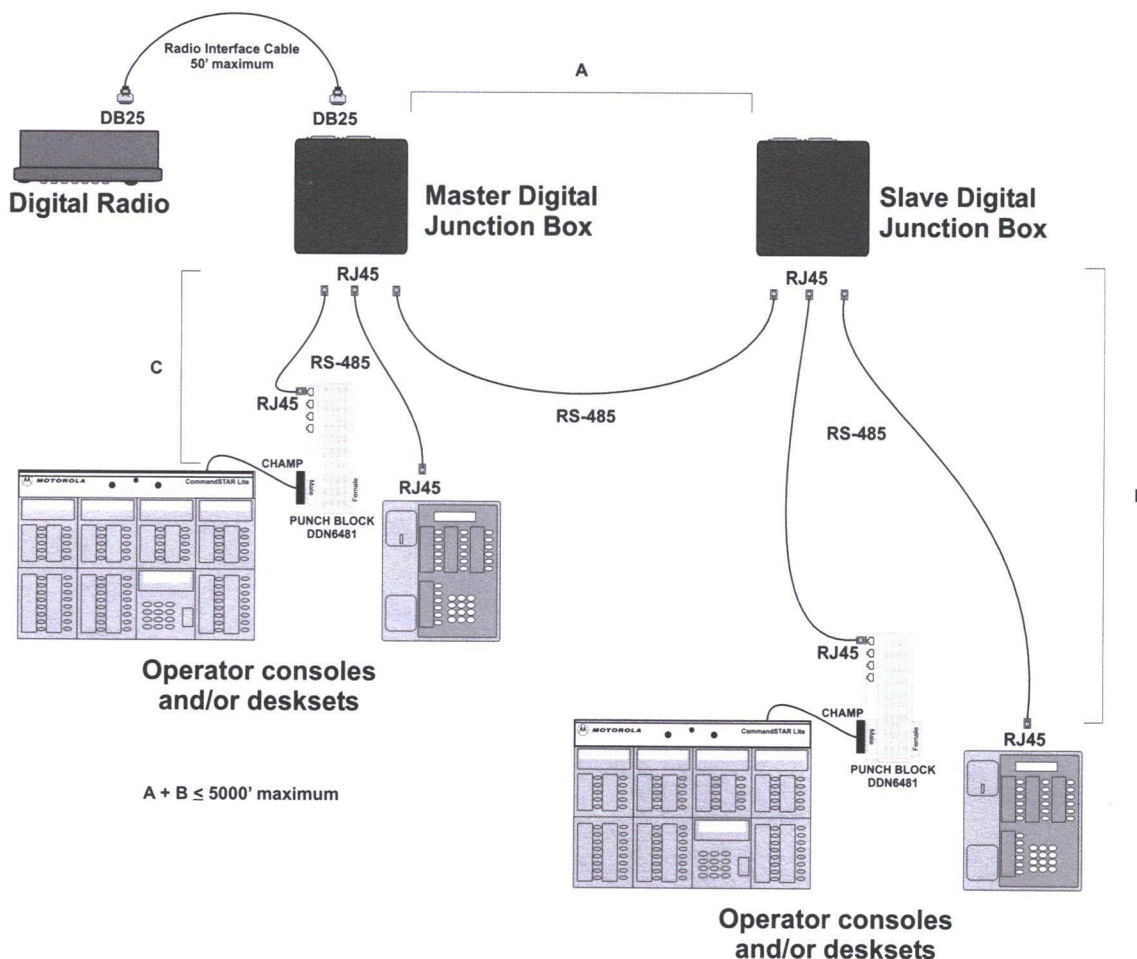


Figure 2-4: Multiple Digital Junction Box connections

## Sequence of Installation Procedures

Installing one or more Digital Junction Boxes involves the following procedures:

1. Preparing for installation by locating an appropriate installation site for each Digital Junction Box.
2. Setting the DIP switch and jumpers for each Digital Junction Box.
3. Adjusting the potentiometer, as required.
4. Installing each Digital Junction Box in an optional rackmount shelf, if desired.
5. Grounding each Digital Junction Box (For more information, see the grounding specifications in *Motorola R56—Standards and Guidelines for Communications Sites* — 6881089E50).
6. Connecting a Digital Junction Box to the radio.
7. Connecting each Digital Junction Box to operator consoles and/or desksets, as required.
8. Making connections between Digital Junction Boxes, as required.
9. Connecting a power supply to each Digital Junction Box.
10. Verifying the installation.

You should complete these procedures in the order listed above. Subsequent sections of this chapter describe each procedure in detail.

## Digital Junction Box Layout

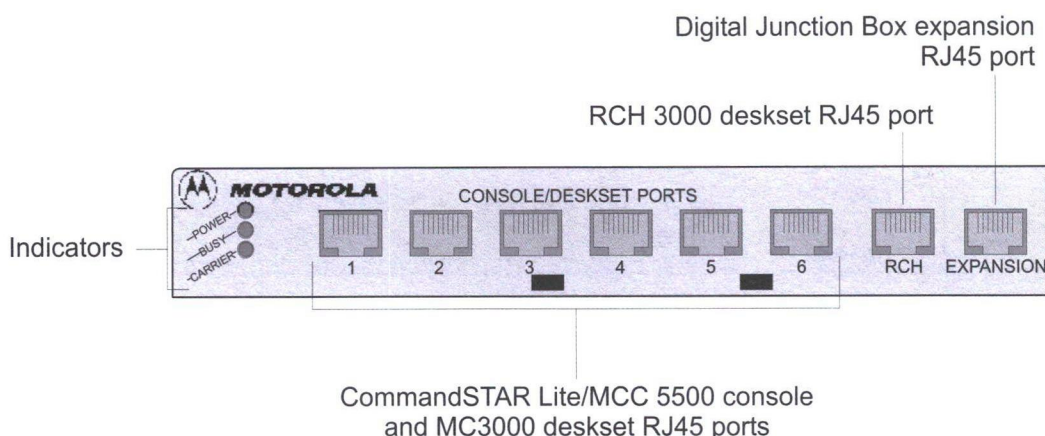
This section describes the Digital Junction Box front and back panel ports, and explains how to remove the Digital Junction Box cover.

### Digital Junction Box Front Panel

The front of the Digital Junction Box contains the following ports:

- Six RJ45 ports for connections to consoles and MC3000 desksets.
- One RJ45 port for a connection to an RCH 3000 deskset (MCS/Consolette only).
- One RJ45 port for a local connection to another Digital Junction Box.

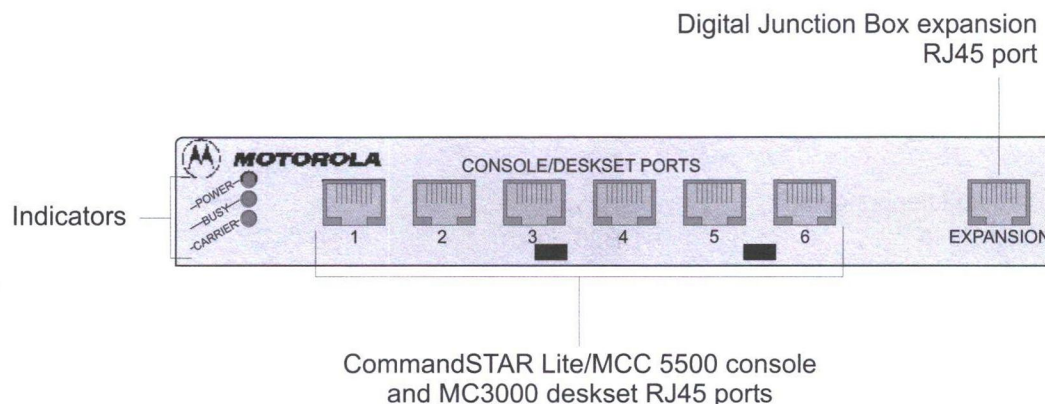
Figure 2-4: shows the front panel of the MCS/MTM700/Consolette Digital Junction Box, with ports labeled.



**Figure 2-5: MCS/MTM700/Consolette Digital Junction Box front panel**

**Note:** The RCH port is not compatible with the MTM700 (Dimetra) radio. Use the DB25 port on the back of the Digital Junction Box to connect to the MTM700 (Dimetra) radio.

Figure 2-6 shows the front panel of the CDM1550 series (LTR) Digital Junction Box, with ports labeled.



**Figure 2-6: CDM1550 series (LTR) Digital Junction Box front panel**

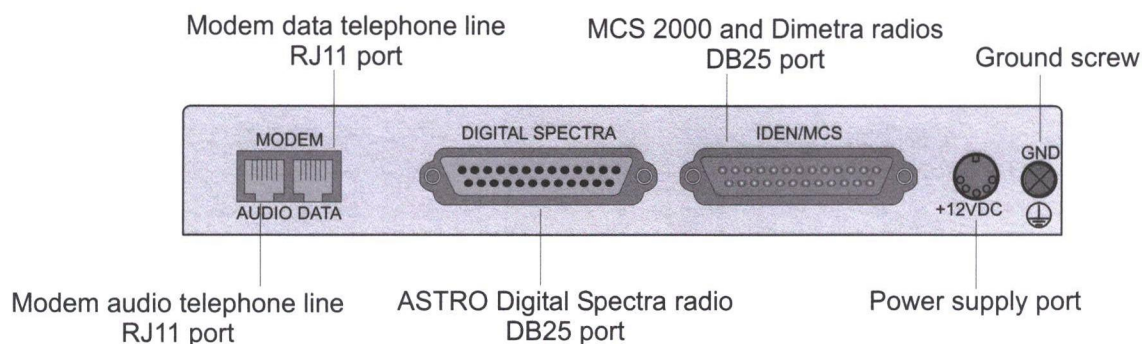


## Digital Junction Box Back Panel

The back of the Digital Junction Box contains the following ports:

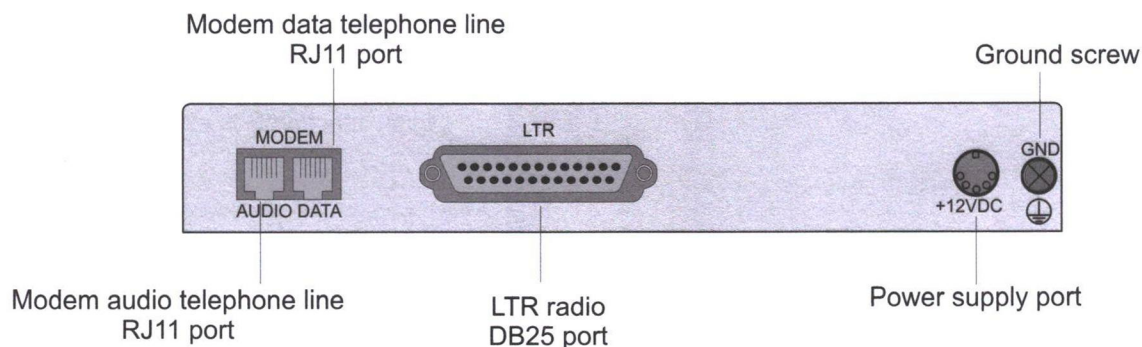
- Two RJ11 ports for modem data and audio telephone line connections.
- Two DB25 ports for the radio connection: one port for a Digital Spectra Consolette radio, and one port for an MCS 2000 or MTM700 (Dimetra) radio (MCS/MTM700/Consolette Digital Junction Box only).
- One DB25 port for the CDM1550 series radio connection (CDM1550 series (LTR) Digital Junction Box only)
- DIN port for connection to +12 VDC converter power supply.

Figure 2-7 shows the back panel of the MCS/MTM700/Consolette Digital Junction Box, with ports labeled.



**Figure 2-7: MCS/Consolette Digital Junction Box back panel**

Figure 2-8 shows the back panel of the CDM1550 series (LTR) Digital Junction Box, with ports labeled.

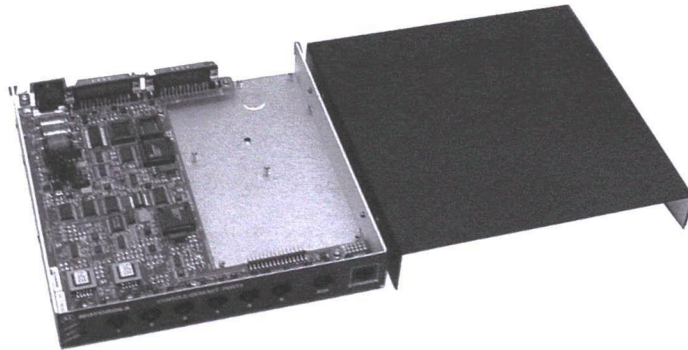


**Figure 2-8: CDM1550 series (LTR) Digital Junction Box back panel**



## Digital Junction Box Cover

The Digital Junction Box consists of two main pieces: the base and the cover. The cover fits over the base, and the two are held together by screws on either side and on the back of the Digital Junction Box. Figure 2-9 shows the Digital Junction Box with the cover removed, and Figure 2-10 shows the screws that you need to remove to open the Digital Junction Box.



**Figure 2-9: Digital Junction Box base and cover**

During the installation procedure, you may need to remove the cover on the Digital Junction Box to perform such tasks as changing DIP switch and jumper settings.



**Figure 2-10: Digital Junction Box screws**

### *Removing the Digital Junction Box Cover*

**Note:** This procedure requires Phillips #0 and Phillips #2 screwdrivers.

To remove the Digital Junction Box cover:

1. Use a Phillips #2 screwdriver to remove the ground screw from the back of the Digital Junction Box.

The ground screw is a #8 Phillips flat head screw. For the location of the ground screw on the back of the Digital Junction Box, see Figure 2-7 on page 2-8 or Figure 2-8 on page 2-8.

2. Use a Phillips #0 screwdriver to remove the four black screws on the sides of the Digital Junction Box.

The screws are #4 Phillips flat head screws.

3. Slide the Digital Junction Box cover back approximately one-quarter of an inch.
4. Carefully lift the Digital Junction Box cover straight up.

The Digital Junction Box cover is removed.

## **Preparation for Installation**

Before installing one or more Digital Junction Boxes, you need to complete the following preparations:

- Determine a location for the Digital Junction Box or Boxes, keeping these points in mind:
  - Operator consoles and desksets must be located no more than 5000 ft (1524 m) from the Master Digital Junction Box (2000 ft [610 m] for a single console or deskset), unless an RCH 3000 deskset is used, which is limited to no more than 50 ft (15.24 m) from the Master Digital Junction Box.
  - The RCH port is only functional on the Master Digital Junction Box, that is, the Digital Junction Box connected to the radio.
  - The Master Digital Junction Box must be located no more than 50 ft (15.24 m) from the radio.
- Determine a ground location as per *Motorola R56—Standards and Guidelines for Communications Sites*.
- Verify that a 120V AC power outlet is available to supply power to the Digital Junction Box.
- Ensure that operating conditions conform to the ranges given in "Specifications" on page 1-3 of Chapter 1.

## DIP switch and Jumper Configuration

A DIP switch and jumpers are located inside the Digital Junction Box:

- Set the switches of the S2 DIP switch to the position that corresponds to the desired Digital Junction Box characteristics.
- Set the jumpers to correspond to the type of radio that you are connecting to the Digital Junction Box.

Figure 2-11 shows the location of the DIP switch and jumpers in the Digital Junction Box.

### DIP switch Settings

Table 2-1 lists DIP switch settings. Figure 2-11 shows the location of the DIP switch (component **S2**) in the Digital Junction Box.

**Table 2-1: DIP Switch Settings**

DIP switch (S2)	Setting	Description
1	ON	Digital Junction Box is configured as Master (Default).
	OFF	Digital Junction Box is configured as Slave.
2	OFF	Reserved (Default).
3	ON	Modem installed, Digital Junction Box is Master (Default).
	OFF	Modem or no modem installed, Digital Junction Box is Slave.
4	ON	This is a model L3239 (CDM) Digital Junction Box.
	OFF	This is a model L3208 Digital Junction Box.
5	ON	Test mode. Generate 1100Hz test tone for modem.
	OFF	Normal operation (Default).
6	ON	PTT Synchronization Enable. For use ONLY on Console Master Digital Junction Box when optional modem is installed, i.e., S2-1=ON, S2-3=ON and S2-4=OFF
	OFF	PTT Synchronization Disable (Default).
7	ON	Console Emergency Call Decode Enable (Default). For use ONLY on Console Master Digital Junction Box
	OFF	Console Emergency Call Decode Disable. For use for ALL other radio types and Slave Digital Junction Box, S2-1=OFF
8	ON	Enable communication with MTM700 (Dimetra) Mobile Radios. For use ONLY on MTM700 Master Digital Junction Box.
	OFF	Normal operation (Default).



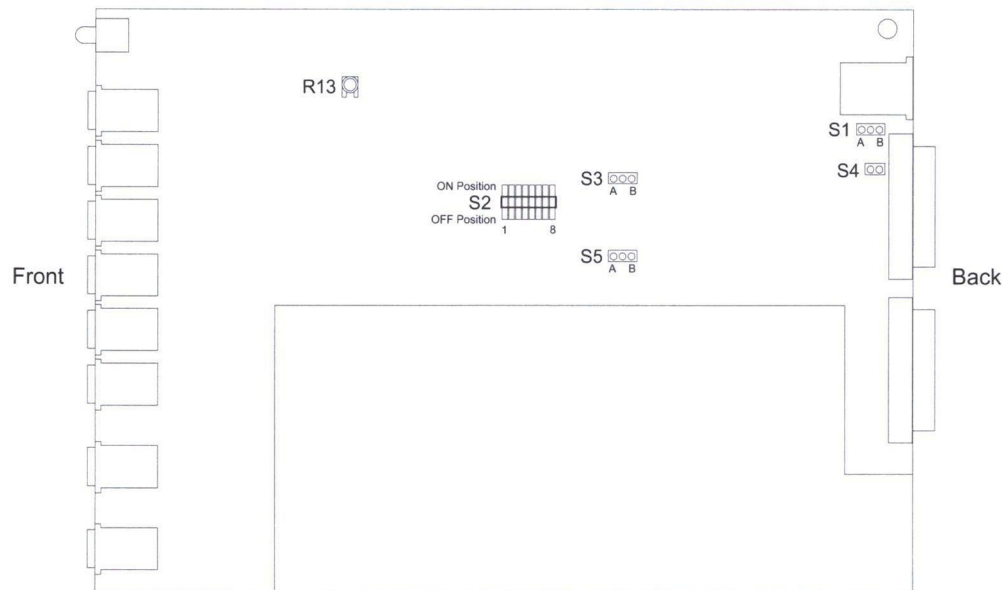


Figure 2-11: Digital Junction Box DIP switch, jumper, and potentiometer locations

Jumper Settings

The jumpers enable you to set the type of radio connected to the Digital Junction Box. Figure 2-11 shows the location of the jumpers inside the Digital Junction Box, and Table 2-2 describes the Digital Junction Box jumper settings. Verify that the jumper settings are correct for your configuration, and change the settings if necessary.

Table 2-2: Digital Junction Box jumper settings

Radio Type	Jumper Settings		
	S1	S4	S5
CDM1550 series (LTR) or Consolette (Default)	A in	Out	B in
MCS 2000 (model III) or MTM700 (Dimetra)	B in	In	B in

**Note:** S3 is reserved and not used at this time.

Potentiometer Settings

For your information, the Digital Junction Box has one potentiometer setting and its purpose is to adjust the audio level coming from the radio and going to the console/deskset. The 50K $\Omega$  potentiometer shown in Figure 2-11 is labeled R13 and is set to the midrange position (approx. 25K $\Omega$  $\pm$ 10%).



## Rackmount Shelf Installation

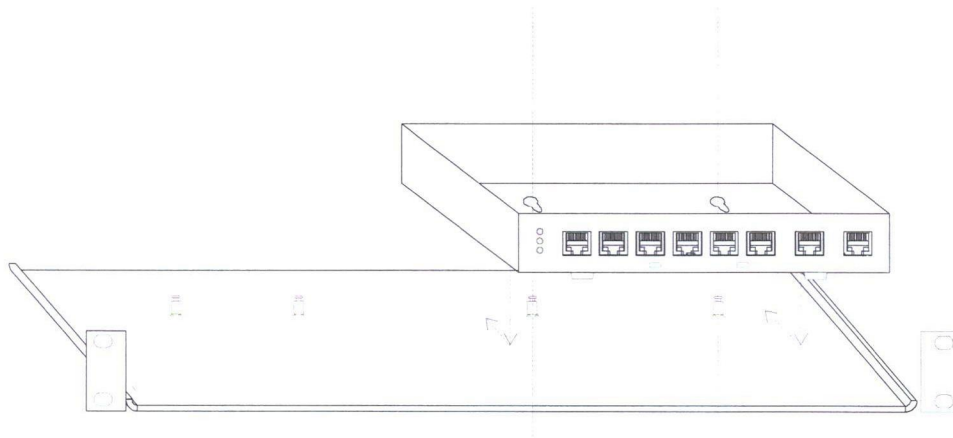
The Digital Junction Box installs in an optional 19 inch long rackmount shelf (part number DDN6335). You can mount two Digital Junction Boxes side by side in a single shelf. The shelf itself mounts in any rackmount frame or cabinet that meets the 19-inch EIA (Electronic Industries Alliance) standard.

**Note:** This procedure requires a Phillips #0 screwdriver.

To install a Digital Junction Box in a rackmount shelf:

1. Align the larger, circular ends of the two holes in the bottom of the Digital Junction Box with a set of two grips on the rackmount shelf.

The grips are the small cylindrical objects that stick up from the base of the shelf. There are two sets of grips, one set on each side of the shelf. See Figure 2-12, below, for an illustration of how to position the Digital Junction Box on the rackmount shelf.

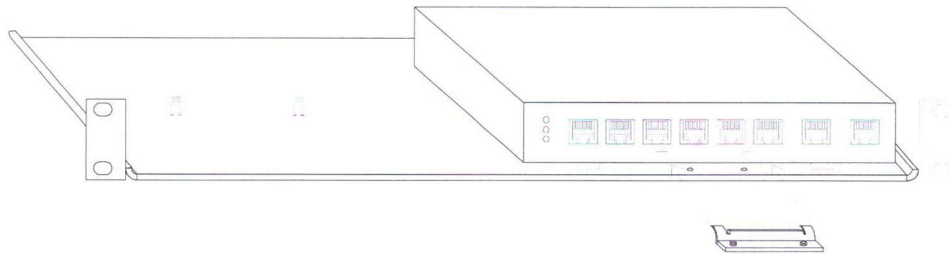


**Figure 2-12: Positioning Digital Junction Box on rackmount shelf**

2. Carefully lower the Digital Junction Box until it is sitting on the shelf, with the grips inserted in the holes in the Digital Junction Box base.
3. Push the Digital Junction Box back slowly until you cannot move it any further.

The grips should now be firmly secured in the narrower front sections of the holes on the Digital Junction Box base.

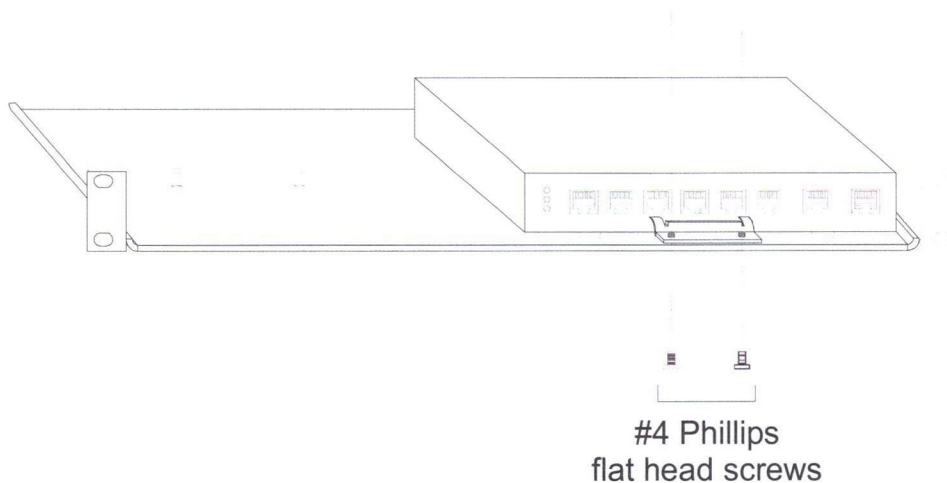
4. Insert the two slats on the rackmount bracket into the two rectangular holes on the Digital Junction Box front panel. See Figure 2-13, below, for an illustration of how to insert the bracket into the Digital Junction Box.



**Figure 2-13: Inserting rackmount bracket into Digital Junction Box**

5. Align the two holes on the bottom of the bracket with the two holes at the front of the rackmount shelf.
6. Using a Phillips #0 screwdriver and the two #4 Phillips flat head screws that come with the bracket, screw the bracket to the shelf. See Figure 2-14, below, for an illustration of how to screw the bracket into the rackmount shelf.

The Digital Junction Box is installed in the rackmount shelf.



**Figure 2-14: Screwing rackmount bracket onto rackmount shelf**

7. If desired, mount the rackmount shelf in any rackmount frame or cabinet that meets the 19-inch EIA standard.

## Grounding

A ground screw is located on the back panel of the Digital Junction Box, as shown in Figure 2-7 on page 2-8 and Figure 2-8 on page 2-8. Following the guidelines given in Chapter 1, ground the Digital Junction Box by connecting this screw to the system main ground.

## Radio Connection

The connection between the Digital Junction Box and the radio requires a radio interface cable:

- Radio interface cable (part number DDN6333) connects to the ASTRO Spectra Console, ASTRO Spectra Plus Console, XTL 5000 Console or radio.
- Radio interface cable (part number HKN6123) connects to the MCS 2000 radio.
- An RJ45 to DB25 adapter and Category 5 twisted pair cable (part number RKN4077 [10 ft.]) are used for the CDM1550 series (LTR) radio.

Depending on how far the radio is located from the Digital Junction Box, you may require more than one interface cable.

- An RJ45 cable (10 ft. [3.05 meters]) and two RJ45 to DB25 adapters, one male and the other female, as supplied in the MTM700 radio kit (part number DDN8244A), are used for the MTM700 (Dimetra) radio connection.

**Note:** For the MTM700 (Dimetra) radio, you must first connect the female RJ45 to DB25 adapter to the Digital Junction Box and connect the male RJ45-DB25 adapter to the expansion head of the MTM700 (Dimetra) radio, before connecting the two with an RJ45 cable of the required length, not to exceed 50 ft.

Depending on how far the radio is located from the Digital Junction Box, you may require more than one radio interface cable.

**Caution:** Be careful to plug the radio interface cable into the correct radio port, and never attempt to connect two radios to the Digital Junction Box at the same time. Connecting the radio interface cable to the wrong port, or using more than one radio port on the Digital Junction Box at a time, could result in damage to the equipment.

For your reference, Figure 2-15 shows the pins for the radio DB25 ports on the back of the Digital Junction Box, and Table 2-3 on page 2-16 gives the DB25 radio port pin-outs.

The connection between DB25 connector pins at either end of the radio interface cable is pin-to-pin: that is, pin 1 connects to pin 1, pin 2 to pin 2, and so on. The connection is made over an RS-485 link using Category 5 twisted pair cable.



**Figure 2-15: Digital Junction Box digital radio DB25 port (looking in from outside)**



**Table 2-3: Radio DB25 port pin-out**

DB25 port pin	Signal at Digital Junction Box			
	CDM1550 series (LTR)radio port	Consolette radio port	MCS 2000 radio port	MTM700 (Dimetra) radio ports
1	RX+	Not used	Not used	Ground
2	Data+	Ground	Ground	Not used
3	MIC	MIC	Not used	Not used
4	RX-	Not used	Ground	Not used
5	Ground	Not used	Busy Radio	Not used
6	Busy	Busy Radio	Data+ Radio	Not used
7	Not used	Data+ Radio	Not used	Not used
8	Not used	Not used	Not used	SB9600_BUSY
9	Not used	Not used	Radio Connect	Not used
10	Not used	Not used	Ground	Not used
11	Not used	Ground	Receive Input A	Not used
12	Not used	Ground	Not used	Not used
13	Not used	Not used	Radio Transmit Out	SB9600_BUS-
14	Not used	Receive Input A	Not used	Not used
15	Not used	Receive Input B Con.	Not used	SB9600_BUS+
16	Not used	Not used	Not used	INT_MIC
17	Not used	Not used	Not used	Not used
18	Not used	Not used	Data- Radio	Not used
19	Not used	Data- Radio	Not used	Not used
20	Not used	Not used	Not used	Not used
21	Not used	Not used	Not used	Not used
22	Not used	Not used	Not used	Not used
23	Not used	Not used	Not used	Not used
24	Not used	Not used	Not used	Handset Audio
25	Not used	Not used	Not used	Not used



## Connecting to the Radio

To connect the Digital Junction Box to the Console, MCS or CDM1550 series radio:

1. Ensure that the Digital Junction Box jumpers are set to the correct radio type.  
See “Jumper Settings” on page 2-12 for information on jumper settings.
2. Plug one end of the radio interface cable (cable and RJ45 to DB25 adapter for CDM1550 series) into the appropriate DB25 port on the back of the Digital Junction Box.

See Figure 2-7 on page 2-8 or Figure 2-8 on page 2-8 for the location of the radio port(s) on the Digital Junction Box back panel.

3. If necessary, connect additional cables (10 ft. lengths) of the same type to the first cable, until the cable is long enough to reach the radio.

**Note:** The maximum length of all connected cables cannot exceed 50 ft (15.24 m).

4. Depending on your radio type, plug the cable into the DB25 port of the radio (MCS, MTM700 or Console) or into the RJ45 port on the front of the radio (CDM1550 series).

The Digital Junction Box is connected to the Console, MCS, or CDM1550 series radio.

To connect the Digital Junction Box to the MTM700 (Dimetra) radio:

1. Ensure that the Digital Junction Box jumpers are set to the correct radio type.  
See “Jumper Settings” on page 2-12 for information on jumper settings.
2. Connect the female RJ45 to DB25 adapter found in the MTM700 radio kit (part number 3210866) into the DB-25 port on the back of the Digital Junction Box labelled iDEN/MCS (closest to the power supply port).

See Figure 2-7 on page 2-8 for the location of the radio port(s) on the Digital Junction Box back panel.

3. Connect the male RJ45 to DB25 adapter found in the MTM700 radio kit (part number 3210867) into the MTM700 Expansion Head.
4. Connect the necessary length of RJ45 cable, not exceeding 50 feet (15.24 meters) between the two adapters. The MTM700 radio kit (part number DDN8244A) includes a 10 ft. (3.05 meters) length.

The Digital Junction Box is connected to the MTM700 (Dimetra) radio.

## Console/Deskset Connection

The Digital Junction Box connects to four different types of operator consoles or desksets:

- CommandSTAR Lite consoles (up to six connections)
- MCC 5500 Dispatch Consoles (up to six connections)

- MC3000 desksets (up to six connections)
- RCH 3000 desksets (one connection; MCS/Consolette Digital Junction Box only)

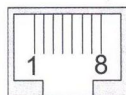
The CommandSTAR Lite or MCC 5500 console and MC3000 deskset connect to the Digital Junction Box through a shared set of six RJ45 ports. The RCH 3000 deskset connects to the Digital Junction Box through a separate RJ45 port. You make the connections over RS-485 links using Category 5 twisted pair cable.

**Caution: When connecting operator consoles or desksets to the Digital Junction Box, always ensure that you are using the correct Digital Junction Box port. Never connect an RCH 3000 deskset to a CommandSTAR Lite or MCC 5500 console, or MC3000 deskset port, or the reverse. Connecting a console or deskset to the wrong Digital Junction Box port could result in damage to the equipment.**

Table 2-4 and Figure 2-16 provide the CommandSTAR Lite Console/MCC 5500/MC3000 Deskset RJ45 port pin-out information. See Figure 2-5 on page 2-7 for the location of the six identical Console/Deskset ports on the Digital Junction Box front panel.

**Table 2-4: CommandSTAR Lite/MCC 5500/MC3000 Deskset RJ45 port pin-out**

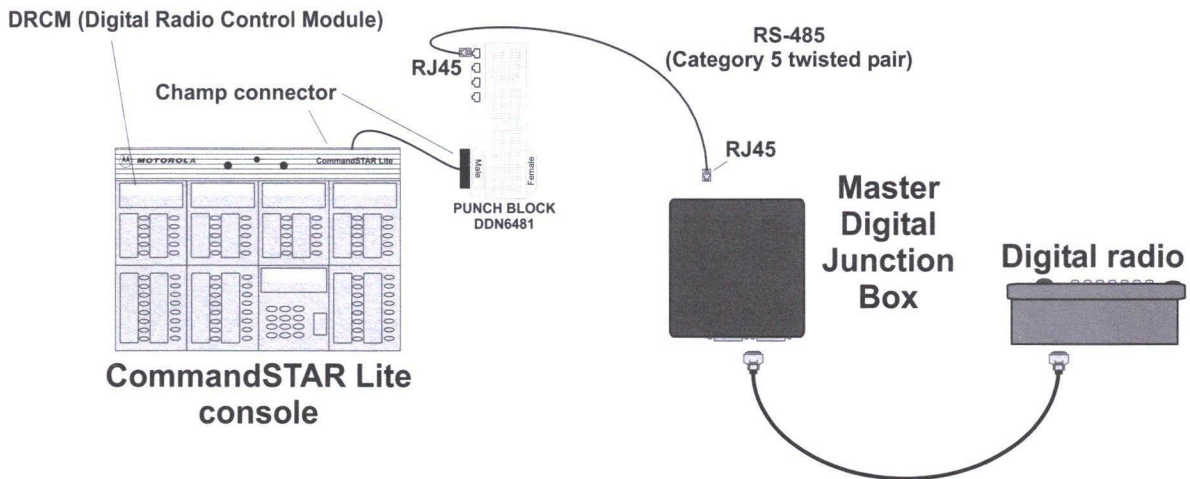
RJ45 Pin	Signal at Digital Junction Box Console/Deskset Ports (Ports 1-6)
1	GND EXT
2	Busy
3	Receive+
4	Transmit+
5	Transmit-
6	Receive-
7	Data-
8	Data+



**Figure 2-16: Digital Junction Box CommandSTAR Lite/MCC 5500/MC3000 Deskset RJ45 port (looking in from outside)**

## Connecting to CommandSTAR Life Console

You make the connections between CommandSTAR Lite consoles and the Digital Junction Box through punch blocks (P/N DDN6481), as shown in Figure 2-17.



**Figure 2-17: CommandSTAR Lite console connection to Digital Junction Box**

Each punch block connects to a 50-pin Champ connector port on the CommandSTAR Lite console. You make the radio channel connections to the CommandSTAR Lite console through these Champ connectors.

Before you connect the CommandSTAR Lite console to the Digital Junction Box, you need to determine the Champ connector pin-out for the Digital Junction Box connection. The *Configuration Manual* for the CommandSTAR Lite console gives the correct Champ connector pin-outs.

### Determine Champ Connector Pin-out

On a CommandSTAR Lite console, a digital radio is controlled by a DRCM (Digital Radio Control Module). You need to consult the console's manual to determine the Champ connector pin-out for the DRCM that you want to connect to the digital radio.

### Connect Digital Junction Box to CommandSTAR Lite Console

To connect the Digital Junction Box to a CommandSTAR Lite console:

1. Prepare a Category 5 pin-to-pin (pin 1 to pin 1, pin 2 to pin 2, and so on) twisted pair cable with an RJ45 connector at both ends.
2. Plug one of the RJ45 connectors into a free CommandSTAR Lite console/deskset port on the front of the Digital Junction Box as pictured in Figure 2-5 on page 2-7.
3. Connect the other end of the cable to the appropriate CommandSTAR Lite console leads at the punch block, as noted in "Determine Champ Connector Pin-out", above.

Refer to Table 2-4 on page 2-18 to determine the signals from the Digital Junction Box port.

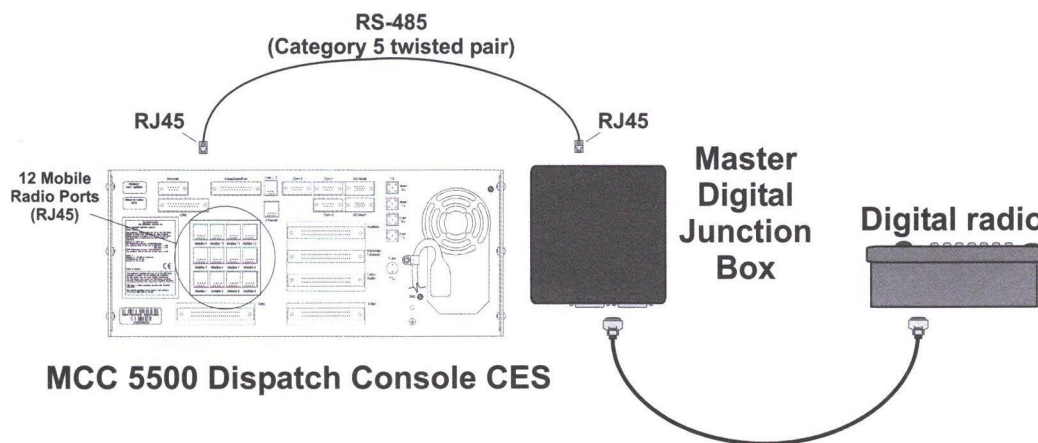


For example, connect Digital Junction Box port pin 8, corresponding to signal **Data+**, as shown in Table 2-4, to the lead identified at the punch block as the **Data+** lead for the appropriate DRCM on the CommandSTAR Lite console.

The CommandSTAR Lite console is connected to the Digital Junction Box.

## Connecting to MCC 5500 Dispatch Console

You make connections between MCC 5500 consoles and the Digital Junction Box, using twisted pair cable with RJ45 connectors at each end, as shown in Figure 2-19. Each MCC 5500 console has a console electronics shelf (CES) with 12 ports for use with digital mobile radio channels. All channels are shared amongst all consoles in a system.



**Figure 2-18: MC3000 connection to Digital Junction Box**

To connect the Digital Junction Box to an MCC 5500 console:

1. Prepare a Category 5 twisted pair cable with an RJ45 connector at each end.  
*See the MCC 5500 Dispatch Console Installation and Service Manual (6881005Y65) for information on the cables for each supported digital mobile radio.*
2. Plug one end of the cable into a free MCC 5500 port (labeled CONSOLE/DESKSET) on the front of the Digital Junction Box.  
*See Figure 2-5 on page 2-7 for the location of the MCC 5500 ports on the Digital Junction Box front panel.*
3. Plug the other end of the cable into a free MCC 5500 CES Mobile Radio RJ45 port (labeled Mobile 1 to Mobile 12) on the rear of the MCC 5500 Console Electronics Shelf (CES). The CES and port selected must correspond to a channel configured for the desired digital mobile radio.

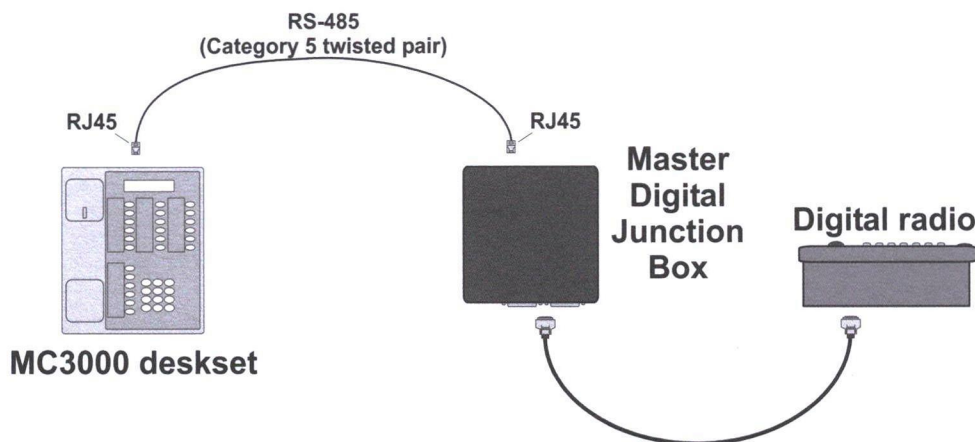
One channel on the MCC 5500 console is connected to the Digital Junction Box.

**Note:** Only one radio channel from an MCC 5500 network can be connected to any single Digital Junction Box.



## Connecting to MC3000 Deskset

You make connections between MC3000 desksets and the Digital Junction Box, using twisted pair cable with RJ45 connectors at each end, as shown in Figure 2-19.



**Figure 2-19: MC3000 connection to Digital Junction Box**

To connect the Digital Junction Box to an MC3000 deskset:

1. Prepare a Category 5 twisted pair cable with an RJ45 connector at each end.

The connections between the RJ45 pins should be one-to-one. That is, pin 1 on one RJ45 connector should connect to pin 1 on the other RJ45 connector, pin 2 should connect to pin 2, and so on, as shown in Table 2-5 on page 2-22.

2. Plug one end of the cable into a free MC3000 port (labeled CONSOLE/DESKSET) on the front of the Digital Junction Box.

See Figure 2-5 on page 2-7 for the location of the MC3000 ports on the Digital Junction Box front panel.

3. Plug the other end of the cable into the RJ45 Audio port on the MC3000 deskset.

The MC3000 deskset is connected to the Digital Junction Box.

**Table 2-5: RJ45 Digital Junction Box (DJB) Console/Deskset Port to MC3000 pin-out**

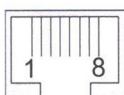
Signal at DJB Console/ Deskset Ports 1-6	RJ45 Pin at DJB Console/ Deskset Ports 1-6	RJ45 Pin at MC3000 Deskset
GND EXT	1	1
Busy	2	2
Receive+	3	3
Transmit+	4	4
Transmit-	5	5
Receive-	6	6
Data-	7	7
Data+	8	8

### Connecting to RCH 3000 Deskset (MCS/Consolette Only)

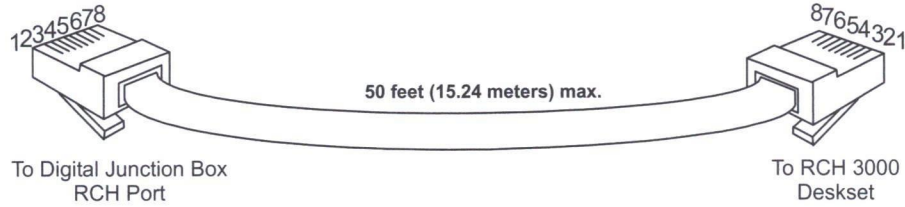
Table 2-6 and Figure 2-20 and Figure 2-21 provide the RCH port pin-out information. See Figure 2-5 on page 2-7 for the location of the RCH port on the Digital Junction Box front panel. The RCH 3000 deskset may only be connected to the Master Digital Junction Box at a maximum distance of 50 ft (15.24 m), using a Category 5 twisted pair cable with an RJ45 connector at each end. For information on the deskset, refer to your RCH 3000 Deskset Manual.

**Table 2-6: RCH 3000 RJ45 Port to RCH 3000 Deskset pin-out**

Signal at DJB RCH Port	RJ45 Pin at DJB RCH Port	RJ45 Pin at RCH 3000 Deskset
GND EXT	1	1
Data+	2	2
Receive+	3	3
Transmit+	4	4
Transmit-	5	5
Receive-	6	6
Data-	7	7
Busy RCH	8	8



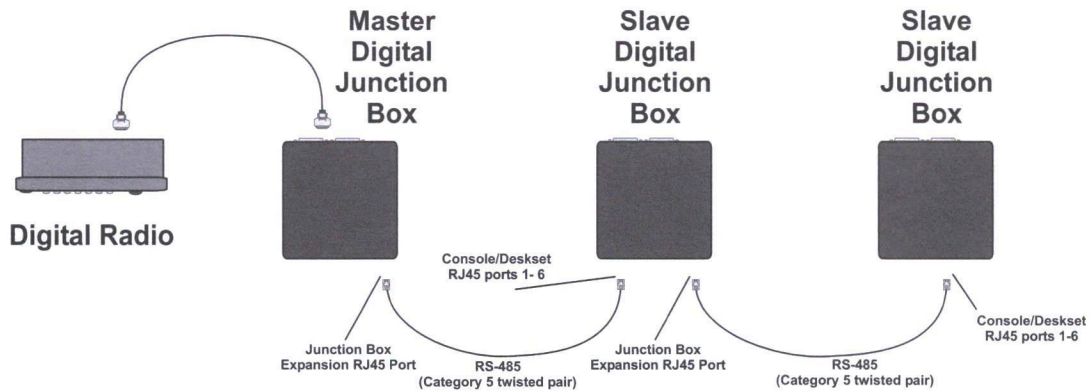
**Figure 2-20: Digital Junction Box RCH 3000 RJ45 port (looking in from outside)**



**Figure 2-21: Mirrored Cable for RCH Deskset Connection**

## Multiple Digital Junction Box Connections

You can connect up to six Digital Junction Boxes together in the manner shown in Figure 2-22 to enable any combination of up to 31 consoles and/or desksets to share access to a single digital radio. The DB25 port on the back of the Master Digital Junction Box connects directly to the digital radio while its Expansion port at the front of the unit connects to a CONSOLE/DESKSET port on the following Slave Digital Junction Box. Each additional Slave Digital Junction Box connects to the next Slave Digital Junction Box using the same type of Expansion port to CONSOLE/DESKSET port connection. The connections consist of RS-485 links using Category 5 twisted pair cable. The maximum distance between a console or deskset and the Master Digital Junction Box is 5000 ft (1524 m) if more than one console or deskset is connected or 2000 ft (610 m) if only a single console or deskset is connected.



**Figure 2-22: Digital Junction Box to Digital Junction Box connection**

Table 2-7 and Figure 2-23 and Figure 2-24 on page 2-24 provide pin-out information for the connection between the Digital Junction Box Expansion RJ45 port and the CONSOLE/DESKSET RJ45 port.



Table 2-7: Pin-outs for additional Digital Junction Box connection

Expansion Port (RJ45)		CONSOLE/DESKSET Ports 1-6 (RJ45)	
Signal	Pin	Pin	Signal
GND EXT	1	1	GND EXT
Busy	2	2	Busy
Receive+	3	3	Receive+
Transmit+	4	4	Transmit+
Transmit-	5	5	Transmit-
Receive-	6	6	Receive-
Data-	7	7	Data-
Data+	8	8	Data+

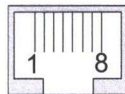


Figure 2-23: Digital Junction Box Expansion RJ45 port (looking in from outside)

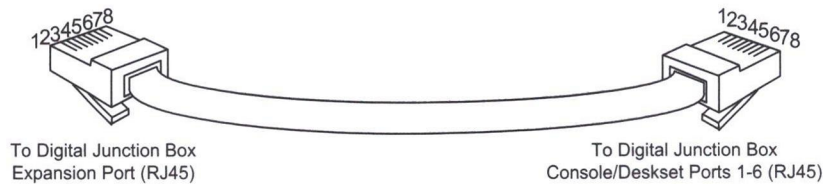


Figure 2-24: Digital Junction Box to Digital Junction Box Cable

## Connecting Additional Digital Junction Boxes

To connect an additional Digital Junction Box:

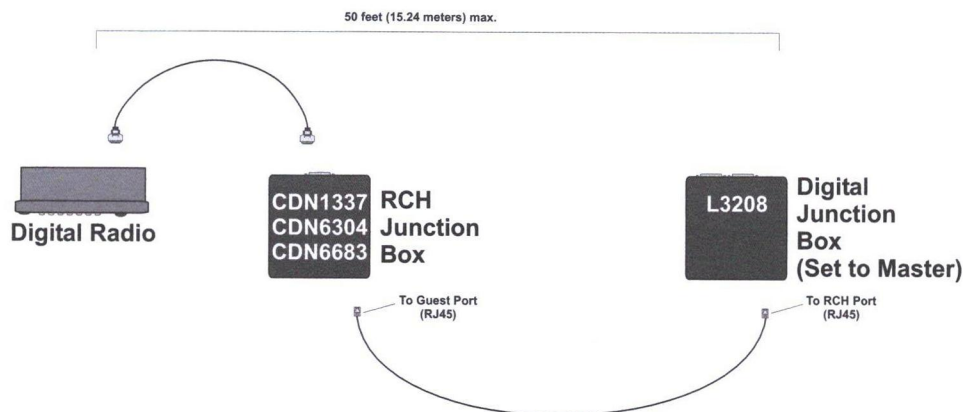
1. Prepare a Category 5 twisted pair cable with an RJ45 connector at each end.  
Connect the RJ45 pins as shown in Table 2-7.
2. Plug one end of the cable into the free Expansion port on the Digital Junction Box of the existing installation.  
See Figure 2-5 on page 2-7 or Figure 2-6 on page 2-7 for the location of the Expansion port on the Digital Junction Box front panel.
3. Plug the other end of the cable into an available CONSOLE/DESKSET port on the additional Digital Junction Box being added to the existing installation.



4. To connect additional Digital Junction Boxes, repeat Steps 1 to 3, above, for each additional connection.

## Connecting a Different Type of Junction Box to an Existing Set Up

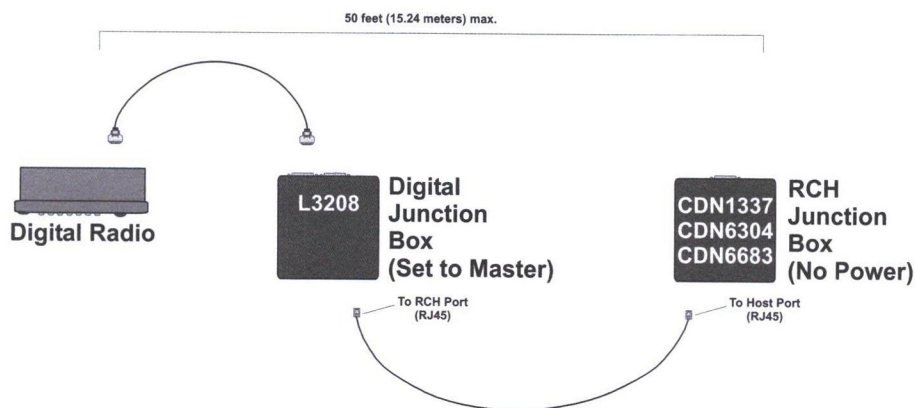
If you have an existing RCH Junction Box set up and want to connect a Digital Junction Box, refer to Figure 2-25 for connection information.



**Figure 2-25: Connecting a Digital Junction Box to an RCH Junction Box Set Up**

**Note:** As before, multiple Digital Junction Box connections are possible. Refer to Figure 2-22 on page 2-23 and Figure 2-4 on page 2-5 for further information. The maximum allowable distance between the Digital Radio and the Digital Junction Box is 50 ft. (15.24 m).

If you have an existing Digital Junction Box set up and want to connect an RCH Junction Box, refer to Figure 2-26 for connection information.



**Figure 2-26: Connecting an RCH Junction Box to a Digital Junction Box Set Up**

**Note:** No Power at the RCH Junction Box means there is no use of an external power supply.

## Connecting a Remote Radio with Modems

Figure 2-27 shows that a radio may be connected remotely to a deskset or console using the modem in the Digital Junction Box at either end of the telephone line. A console is connected to a punch block before connecting to the Digital Junction Box as shown in Figure 2-17. For further information on modems, refer to Appendix A.

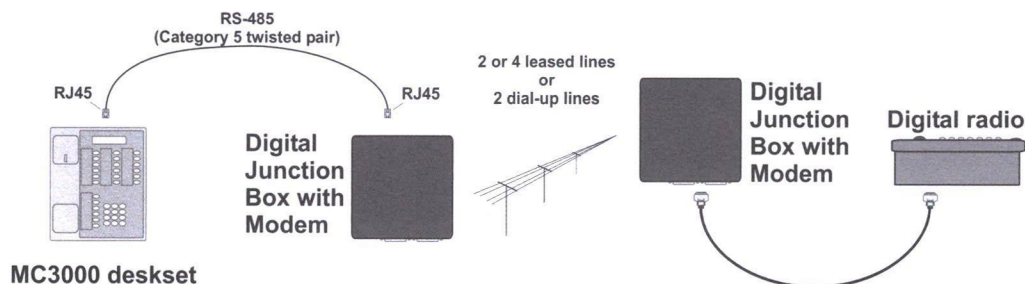


Figure 2-27: Connecting a remote digital radio with modems

## Power Supply Connection

A +12 VDC converter power pack that plugs into a 120 VAC power outlet powers the Digital Junction Box.

For your reference, Table 2-8 gives the power outlet DIN port pin-out, and Figure 2-28 shows the DIN port.

Table 2-8: Power supply DIN port pin-out

DIN Pin	Signal
1	Ground
2	No connection
3	+12 V
4	Ground
5	+12 V

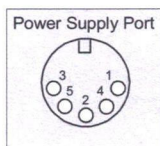


Figure 2-28: Power supply DIN port (looking in from outside)

## Connecting the Power Supply

To connect the Digital Junction Box power supply:

1. Locate the +12 VDC converter power pack (part number DDN6334).
2. Plug the DIN connector at one end of the power pack cable into the power supply DIN port on the back of the Digital Junction Box.

See Figure 2-7 on page 2-8 or Figure 2-8 on page 2-8 for the location of the DIN port.

3. Insert the plug at the other end of the power pack into a 120 VAC power outlet.
4. Verify that the **Power** LED indicator on the front of the Digital Junction Box is on.

The Digital Junction Box power supply is connected.

## Verification

After installing the Digital Junction Box, you should thoroughly test the system to ensure that the Digital Junction Box is functioning properly. This requires that you check individually each console or deskset connection to the radio. For instructions on how to test the radio, consult the following manuals:

- *CommandSTAR Lite Installation and Troubleshooting Manual* (6880309J98)
- *MCC 5500 Dispatch Console System Database Manager Manual* (6881005Y65)
- *MC3000 Installation and Operation Manual* (6880309L15)

To verify the Digital Junction Box installation:

1. Place a call on the channel connected through the Digital Junction Box.

If any links have failed, refer to Chapter 3 "Troubleshooting" and verify the following on the Digital Junction Box:

- Power LED operation as per "Power" on page 3-1
  - Busy LED operation as per "Busy" on page 3-2
  - Sanity LED operation as per "Verifying the Sanity" on page 3-4 (inside unit)
  - Data LEDs (radio and console/deskset) operation on page 3-5 (inside unit)
2. CommandSTAR Lite: Verify that the display on the DRCM shows the radio information, not the message: "Please wait. (Channel name) is connecting to Digital Radio." If the message is displayed, refer to Chapter 3 "Troubleshooting" to troubleshoot the Digital Junction Box.

MC3000: Verify that the display on the deskset shows the radio information, not the message: "Please wait. (Channel name) is connecting to Digital Radio." If the message is displayed, refer to Chapter 3 "Troubleshooting" to troubleshoot the Digital Junction Box.

MCC 5500: If the Digital Junction Box is not correctly connected, the radio channel control on the PC Console shows a large red X across the top. If the channel shows as unavailable (red X), refer to Chapter 3 “Troubleshooting” to troubleshoot the Digital Junction Box.

When an MCC 5500 channel is first identified as connected, a message appears in the CSDM log: “(Channel name) [Main or Stby] Link Up”. When a channel is first identified as no longer connected, a different message appears: “(Channel name) [Main or Stby] Link Down”.

3. Key the radio from each console and deskset, and ensure that you are able to transmit and receive over the radio. Verify the display and LED at the DRCM.
4. Verify that the **Mode Up** and **Mode Down** buttons on each console and deskset properly control the Mode/channel selector on the radio. (On the MCC 5500 PC Console, these buttons are on the shortcut menu for the radio channel control.)
5. For multi-operator configurations, test the Intercom features on all consoles and desksets that are equipped with this feature. Doing so tests the parallel units audio.



## Chapter 3

# Troubleshooting

### Introduction

This chapter describes how to conduct routine checks to ensure that the Digital Junction Box continues to function properly, explains the LED indicators on the front of the Digital Junction Box, and provides some suggestions for troubleshooting a malfunctioning Digital Junction Box.

### Using the Digital Junction Box

Once installed, the Digital Junction Box functions automatically and continuously, as long as it is connected to a power supply. The only tasks that you need to undertake at an operational Digital Junction Box are a series of periodic maintenance checks. These checks ensure that the Digital Junction Box continues to function properly after the installation is complete.

The following routine maintenance checks should be conducted for every Digital Junction Box installed in your system:

- In situations where operator consoles or desksets connected to a Digital Junction Box are not in regular use, periodically test the equipment to ensure that it is still able to communicate properly with the radio.
- Periodically check that the LED indicators on the front of a Digital Junction Box are working properly. See “LED Indicators” on page 3-1 for a description of the LED indicators.

### LED Indicators

The Digital Junction Box front panel contains three LED indicators:

- Power
- Busy
- Carrier

#### Power

The **Power** LED lights when the Digital Junction Box is receiving power from the +12 VDC power pack converter, which is connected to a 120 VAC power supply.

## Busy

The **Busy** LED lights when a communication is in progress over the Digital Junction Box. The communication can be between the radio and an operator console or deskset, or it can be an intercom communication between operator consoles and desksets.

## Carrier

For your reference, the Digital Junction Box does not use the **Carrier** LED.

## Troubleshooting

If a problem occurs and appears to be related to the operation of the Digital Junction Box, there are some preliminary checks that you can undertake to try and determine the source of the problem. Problems with the Digital Junction Box usually fall into one of the following categories:

- General problems with Digital Junction Box operations.
- Problems with a specific connection to an operator console or deskset, a radio, or another Digital Junction Box.

**Caution:** Unauthorized replacement of components could result in damage to the equipment. Contact Motorola for instructions on repairs. See “Contact Address for Service and Repairs” on page 1-4 of Chapter 1 for more information.

**Note:** Before returning the unit, call the system support center for help.

## Problems with Digital Junction Box Operation

If the Digital Junction Box stops working completely, or works only part of the time, perform the following checks:

1. Verify that the other equipment connected to the Digital Junction Box is functioning correctly and that the **Power** indicator is lit on the front of the Digital Junction Box. If the indicator is not lit:
  - Ensure the power supply cable is properly connected to the Digital Junction Box and to the 120 VAC power supply. See “Power Supply Connection” on page 2-26 of Chapter 2 for more information.
  - Check to see if the Digital Junction Box fuse is blown. For instructions, see “Checking the Fuse” on page 3-3.
2. Verify that the voltage levels inside the Digital Junction Box are correct. For instructions, see “Verifying Voltage Levels” on page 3-4.
3. Verify the sanity from the internal LEDs. For instructions, see “Verifying the Sanity” on page 3-4.
4. Verify that the Watchdog circuitry is functioning properly. For instructions, see “Verifying Watchdog Operation” on page 3-4.

If you are unable to determine the source of the problem, or if you locate the source but the solution requires replacing components, contact Motorola with a complete description of the problem. See "Contact Address for Service and Repairs" on page 1-4 of Chapter 1 for information.

### Checking the Fuse

If the Digital Junction Box is properly connected to a 120 VAC power supply, but the **Power** indicator is off, the fuse inside the Digital Junction Box may have blown.

To check the Digital Junction Box fuse:

1. Disconnect the Digital Junction Box from the power supply.
2. Remove the Digital Junction Box cover. For instructions, see "Removing the Digital Junction Box Cover" on page 2-10 of Chapter 2.
3. Check fuse **F1** inside the Digital Junction Box.

See Figure 3-1 for the location of fuse **F1**.

4. If the fuse has blown, you can replace it yourself. The fuse is a 5 x 20 mm cartridge-type slow-blow fuse rated at 1 amp.

If the fuse has not blown, it is possible that the integrated circuit that generates +5 V voltage (component **Q2**) is not working properly. Return the unit to Motorola for repair.

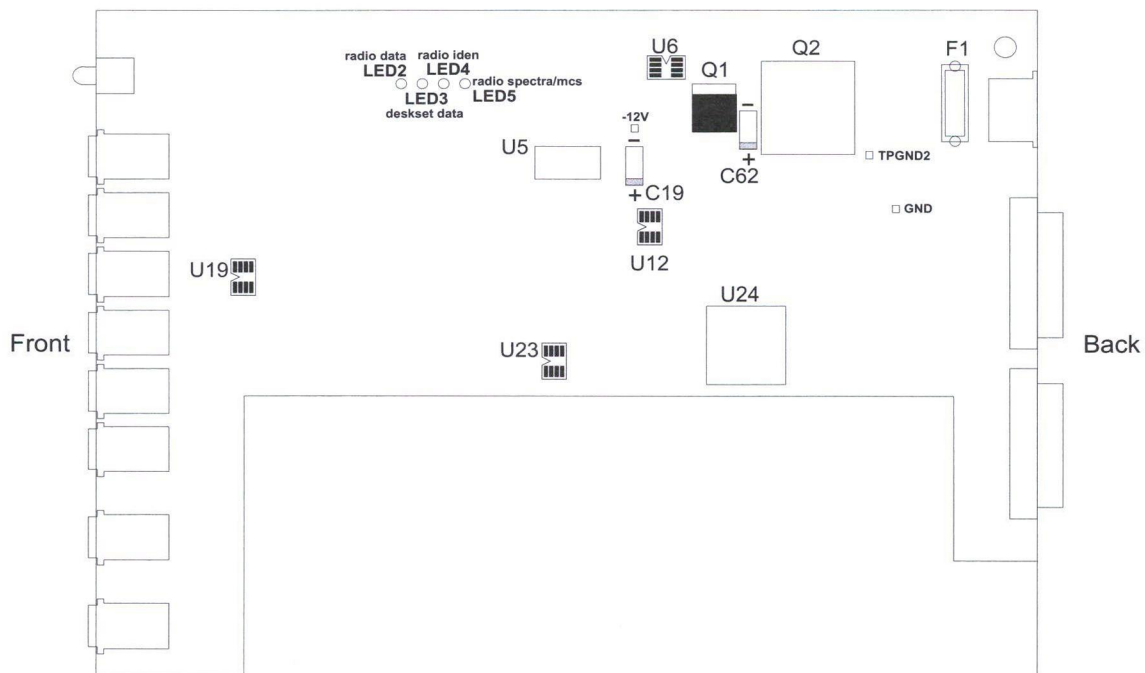


Figure 3-1: Digital Junction Box components troubleshooting diagram



## Verifying Voltage Levels

The Digital Junction Box uses three different DC voltage levels:

- +12 VDC (the main voltage level, obtained from the external power source)
- -12 VDC
- +5 VDC

If the Digital Junction Box is not functioning properly, one of the voltage levels may be wrong.

**Note:** The following procedure requires the use of a digital voltmeter, or a digital multimeter set to the voltmeter function.

To verify the Digital Junction Box voltage levels:

1. Remove the Digital Junction Box cover. For instructions, see "Removing the Digital Junction Box Cover" on page 2-10 of Chapter 2.
2. To verify the +12 VDC voltage level, attach the positive lead from the voltmeter to fuse **F1** and attach the negative lead to ground (**GND** or **TPGND2**). The voltmeter should read +12 V.

For the location of component **F1**, see Figure 3-1 on page 3-3.

If the +12 V voltage level is wrong, there may be a problem with fuse **F1** and the external power supply. Return the unit to Motorola for repair.

3. To verify the +5 VDC voltage level, attach the positive lead from the voltmeter to the positive side of component **C62** and attach the negative lead to ground (**GND** or **TPGND2**). The voltmeter should read +5 V.

If the +5 V voltage level is wrong, it is possible that the fuse **F1** and the integrated circuit that generates +5 V voltage (component **Q2**) is not working properly. Return the unit to Motorola for repair.

4. To verify the -12 VDC voltage level, attach the negative lead to the negative side of component **C19** and attach the positive lead to ground (**GND** or **TPGND2**). The voltmeter should read -12 V.

For the location of the negative side of component **C19**, see Figure 3-1 on page 3-3. (The positive side of **C19** is indicated by a shaded band on the top of the component.)

If the -12 VDC voltage level is wrong, it is possible that the fuse **F1** and components **Q1** and **U6** are not working properly. Return the unit to Motorola for repair.

## Verifying the Sanity

Internal **LED5** for the Consolette (Digital Spectra), MCS 2000 (MCS), MTM700 (Dimetra), or CDM1550 series (LTR) radio blinks for the radio types to indicate processor sanity. If the LED does not blink, the processor is not working. Return the Digital Junction Box to Motorola for repair.

## Verifying Watchdog Operation

The Watchdog (component **U12**) monitors the Digital Junction Box microprocessor (component **U24**), and resets the Digital Junction Box if it detects a problem with the microprocessor's operation. If the Watchdog is malfunctioning, it will likely cause the Digital Junction Box to reset frequently, interrupting all operations.

**Note:** The following procedure requires the use of an oscilloscope.

To verify the operation of the Watchdog circuit:

1. Remove the Digital Junction Box cover. For instructions, see "Removing the Digital Junction Box Cover" on page 2-10 of Chapter 2.
2. Attach the measuring lead (probe tip) from the oscilloscope to pin 6 on component **U12**, and attach the shield lead to ground. The oscilloscope should display a regular square waveform.

If the waveform is not square, then the microprocessor, or the register (component **U5**) that controls the LEDs mounted internally in the Digital Junction Box may be malfunctioning. Return the Digital Junction Box to Motorola for repair.

3. Attach the measuring lead (probe tip) from the oscilloscope to pin 7 on component **U12**, and attach the shield lead to ground. The oscilloscope should show a constant HI signal (above +4.6 V).

If the signal abruptly goes LO (below +4.6 V) for a short period, this indicates that the Watchdog is resetting the Digital Junction Box. In this case, the Watchdog may be malfunctioning. Return the Digital Junction Box to Motorola for repair.

## Problems with Equipment Connections

If a specific connection to a piece of equipment appears to be malfunctioning:

- Verify that the cable and connectors are attached and functioning properly.
- Check that the cable connecting the equipment to the Digital Junction Box is connected correctly. In particular:
  - Ensure that a Consolette radio is plugged into the DIGITAL SPECTRA radio port and is not plugged in to the MCS/iDEN radio port, or the reverse.
  - Ensure that a CommandSTAR Lite console or MC3000 deskset is not plugged in to an RCH 3000 port, or the reverse.
- For a radio connection, ensure that Digital Junction Box jumpers are set for the correct type of radio. See "Jumper Settings" on page 2-12 of Chapter 2 for more information.

Also ensure that the radio is on and is working and that the S2 DIP switch has the first switch set ON so that the Digital Junction Box is configured as a Master Digital Junction Box (that is, IF this is the *Master* Digital Junction Box). See "DIP switch Settings" on page 2-11 of Chapter 2 for more information.

Internal LED component **LED2 (radio data)** blinks quickly to indicate when radio or RCH data is on the bus. If it does not blink, the problem is on the radio side. See Figure 3-1 in this chapter for the internal LED location. LED2 only blinks during activity.

Internal LED component **LED5 (radio spectra/mcs)** blinks when the Digital Junction Box is configured for a Consolette (Digital Spectra), MCS 2000 (MCS), MTM700 (Dimetra), or CDM1550 series (LTR) radio.

- For a console or deskset connection, ensure that the console is on and is working. Internal LED component **LED3 (deskset data)** blinks quickly to indicate when deskset or console data is on the bus. If it does not blink, the problem is on the deskset/con-

sole side. See Figure 3-1 for the internal LED location. LED3 blinks only during activity.

- If the **Busy** LED on a Slave Digital Junction Box flashes at a steady rate, there may be a problem with the connection to the Master or previous Digital Junction Box.
- If connections to one or more operator consoles and/or headsets are not operating properly, there may be a problem with the RS-485 transceiver (component **U19**) which controls communications with the consoles and headsets. Return the unit to Motorola for repair.
- If the connection to the radio is not operating, the RS-485 transceiver (component **U23**) which controls communications with the radio may be malfunctioning. Return the unit to Motorola for repair.



## Chapter 4

# Component Layouts and Schematic Diagrams

### Introduction

This chapter contains component layout and schematic diagrams for the Digital Junction Box. Component parts of the Digital Junction Box, along with the manufacturer's part number and reference number for each component can be found on the schematic diagrams.

This chapter includes the following component layout diagrams:

- Digital Junction Box Component Layout (1 pg.)

This chapter includes the following schematic diagrams:

- Digital Junction Box Main Board (5 pgs.)
- CDM1550 series (LTR) Digital Junction Box Main Board (5 pgs.)

Schematics not identified as CDM1550 series (LTR) (model L3239) are for the L3208 model Digital Junction Box.

## Component Layout Diagrams

### Digital Junction Box

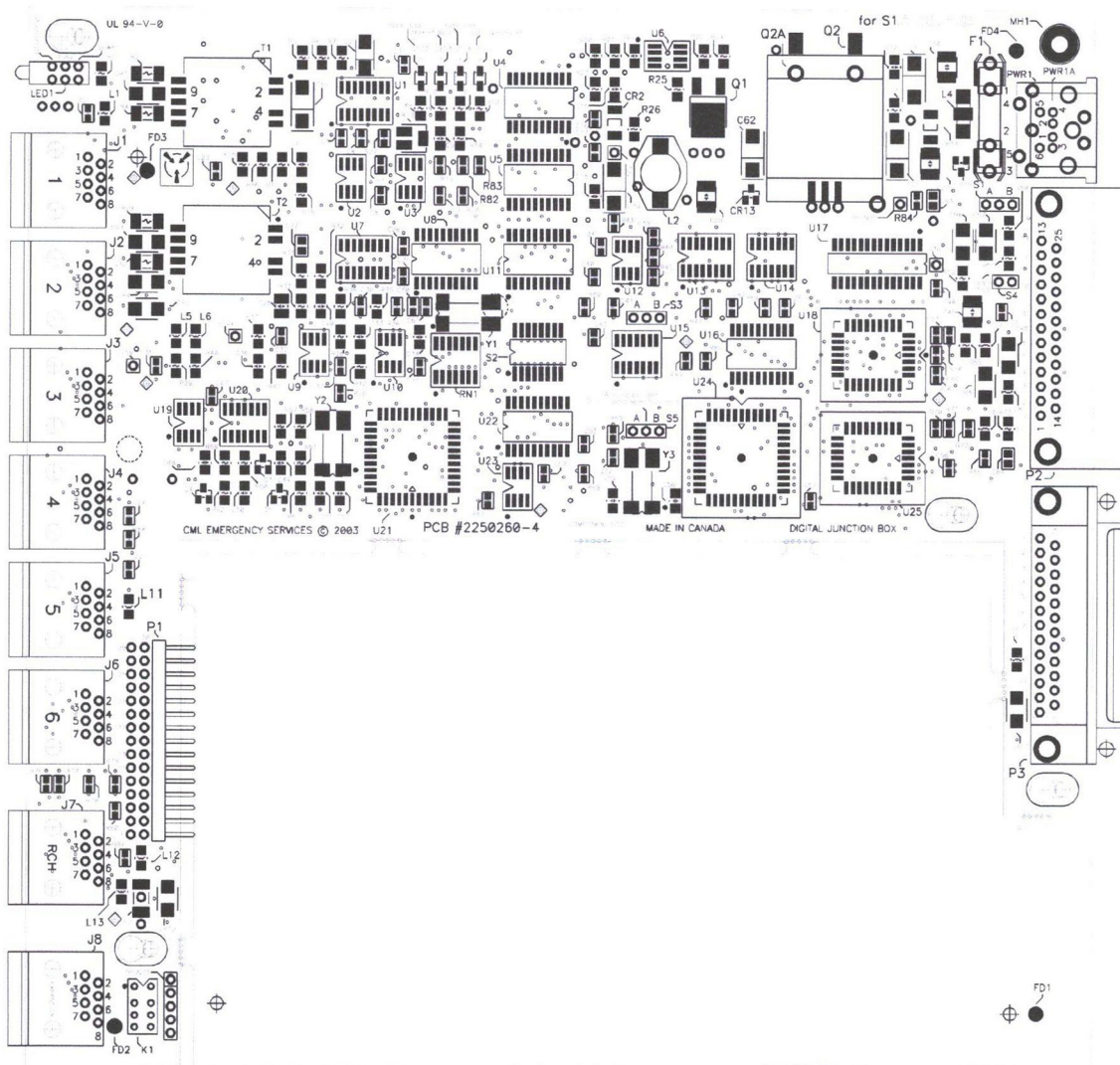
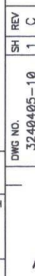


Figure 4-1: Digital Junction Box circuit board

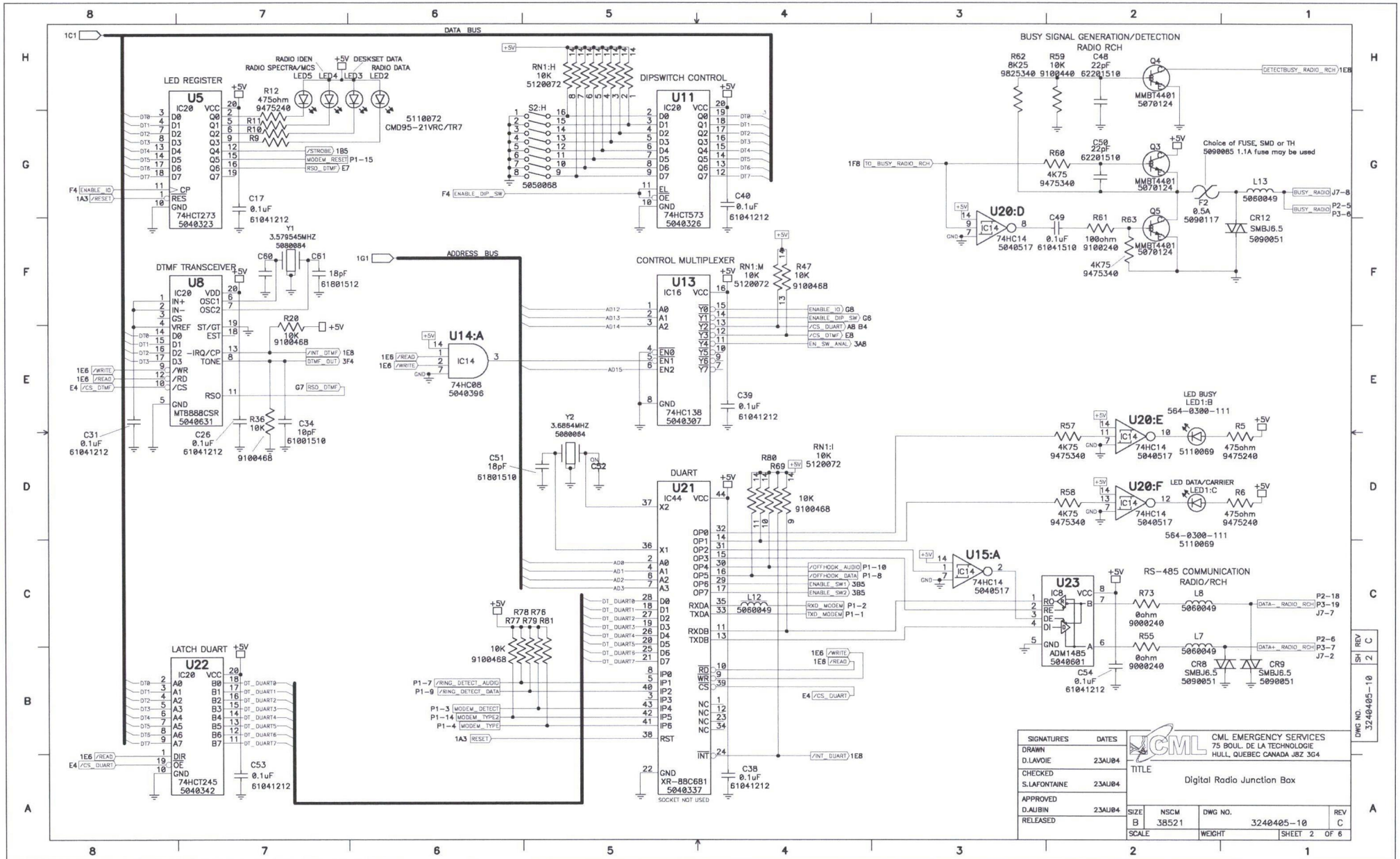
**4-3**





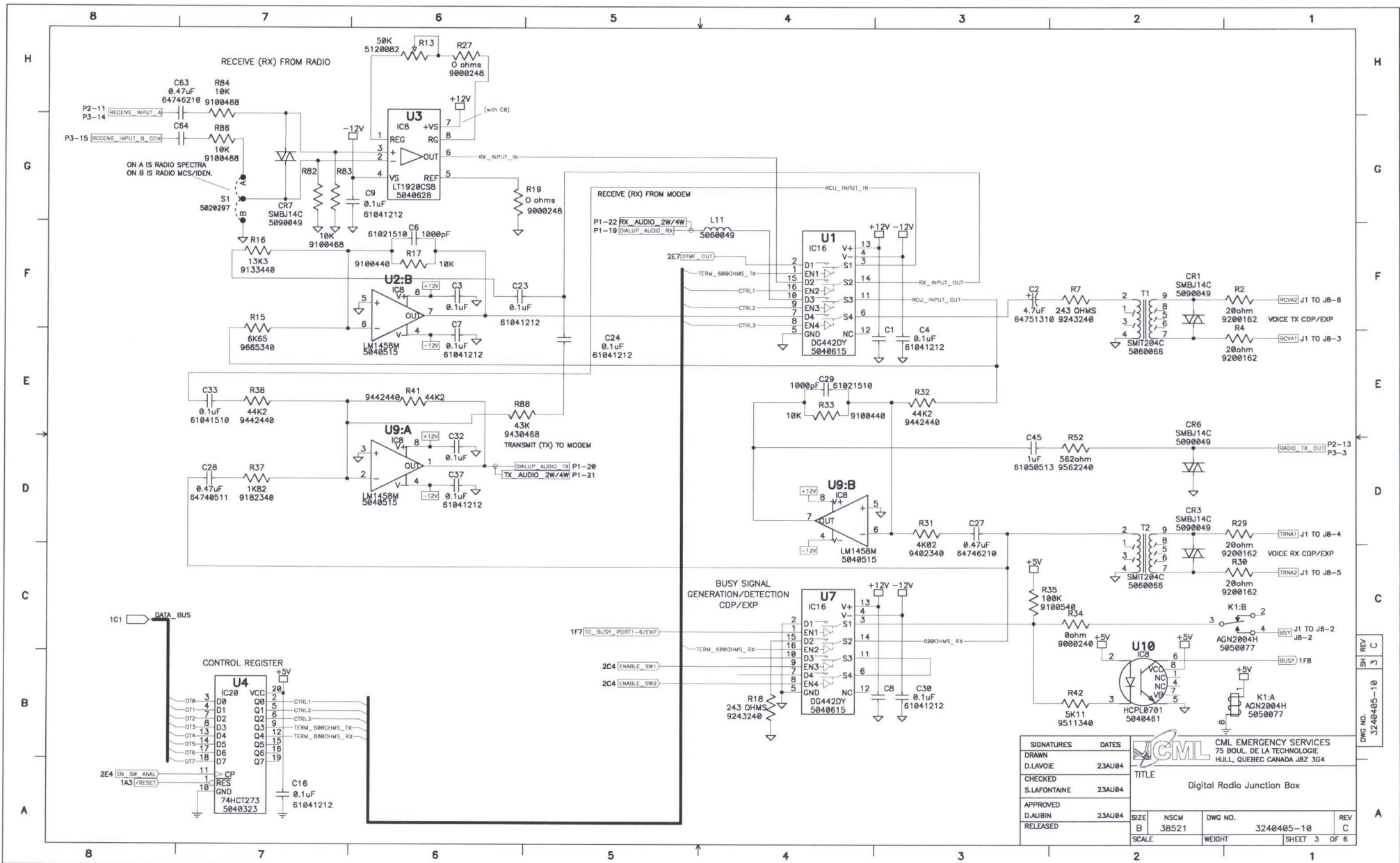
# Schematics — (3210737) Digital Junction Box Main Board (2 of 5)

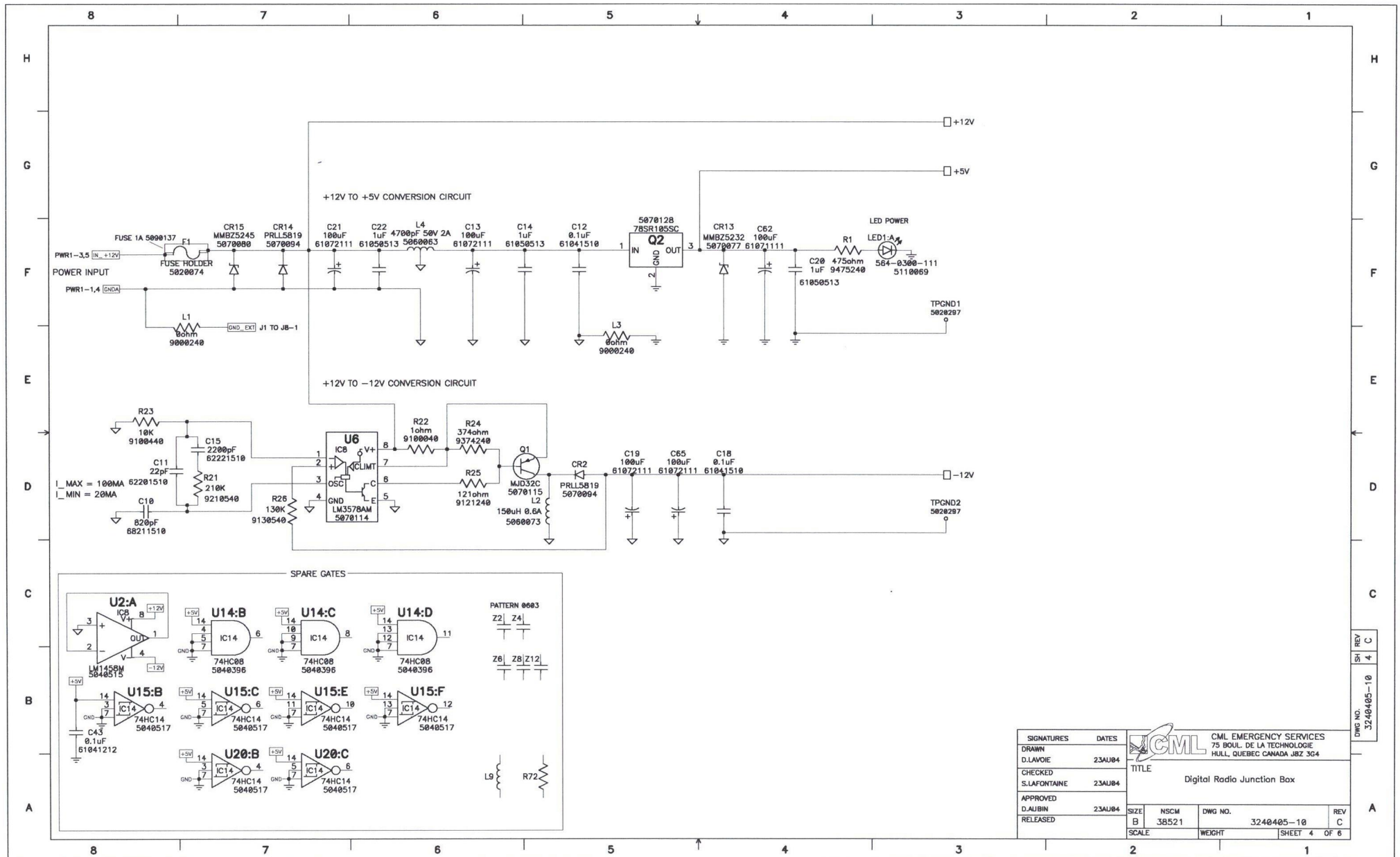
4-4



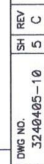
# Schematics — (3210737) Digital Junction Box Main Board (3 of 5)

4-5





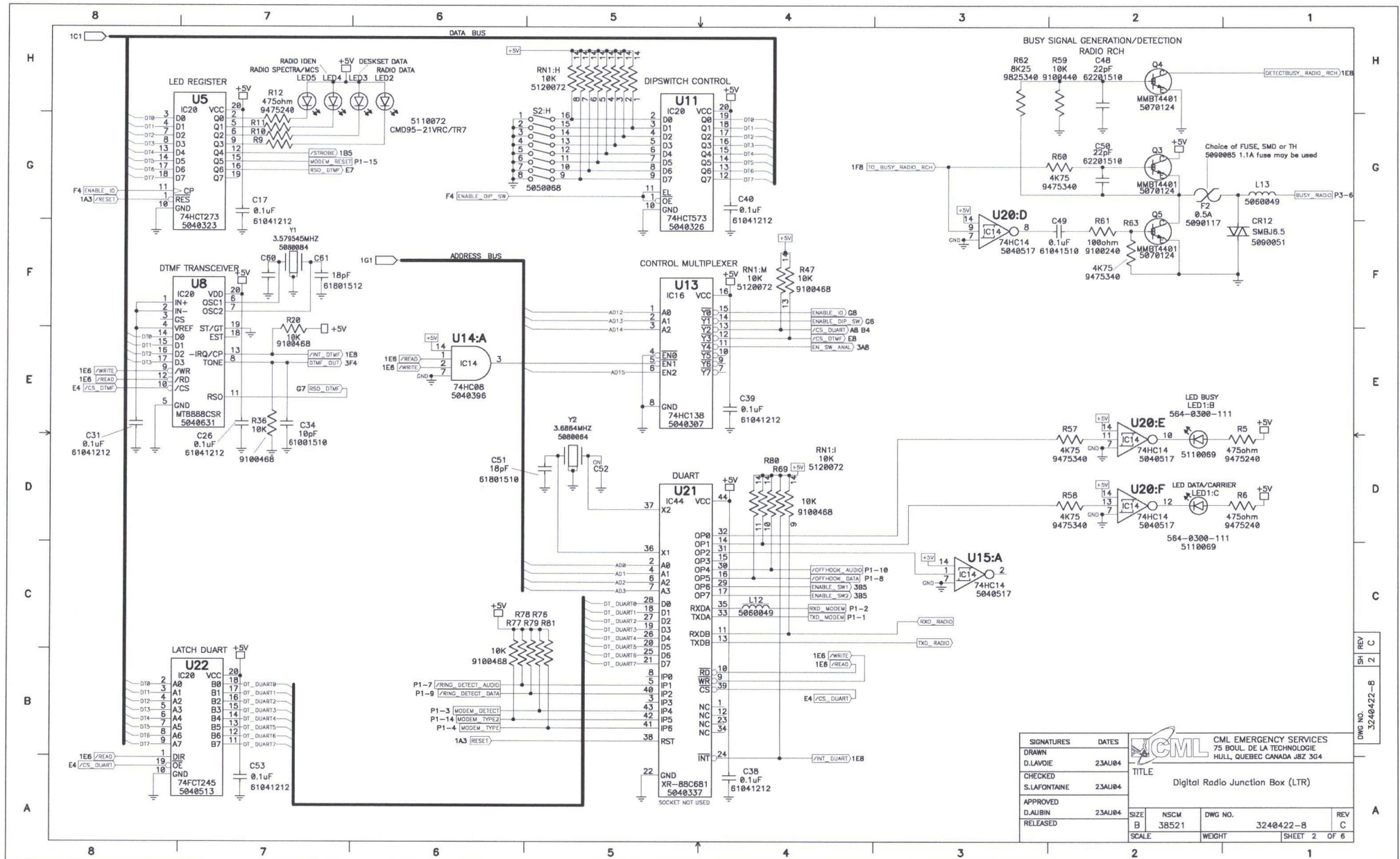




4-8

4-8



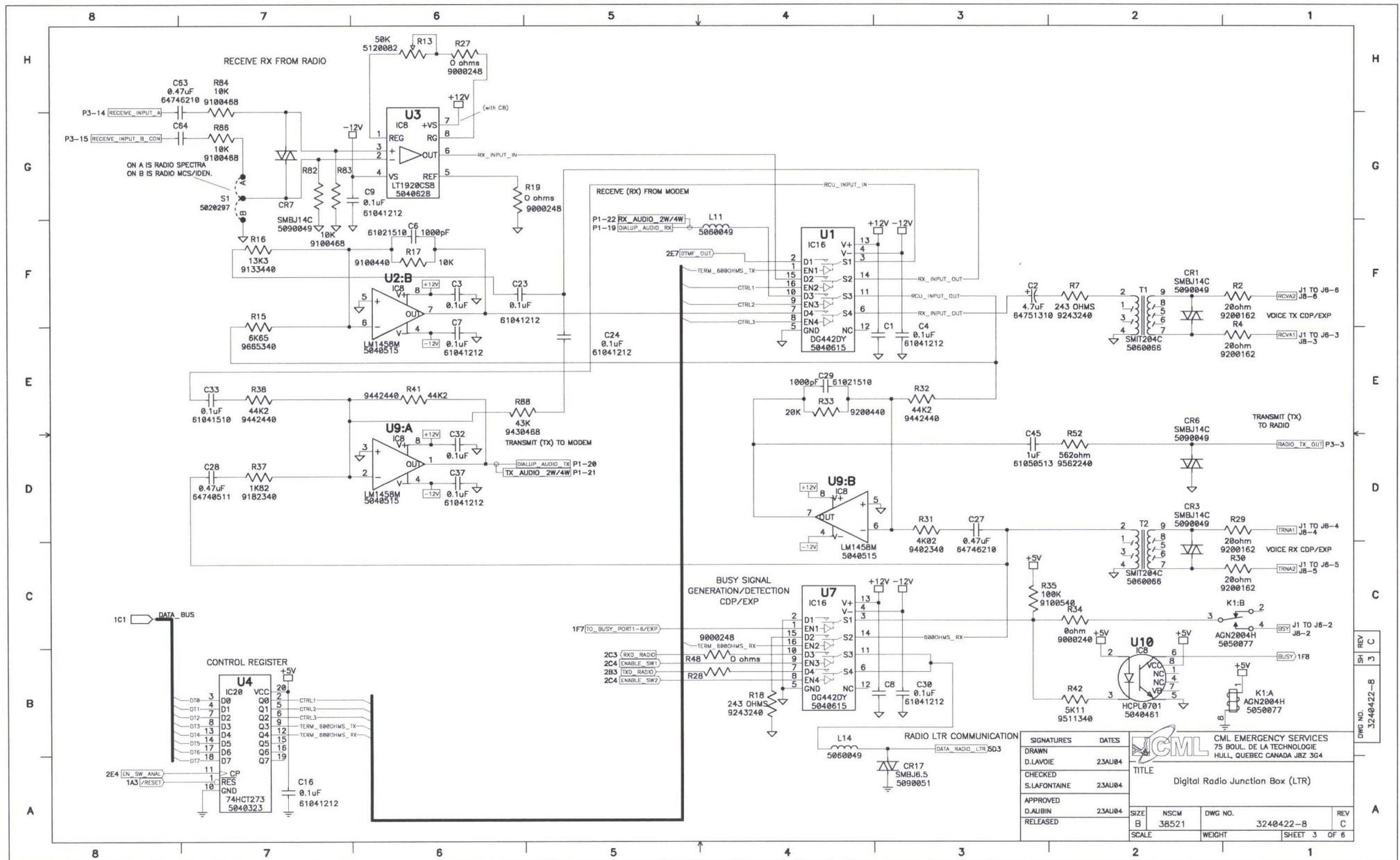




## Schematics — (3210760)

## CDM1550 series (LTR) Digital Junction Box Main Board (3 of 5)

4-10

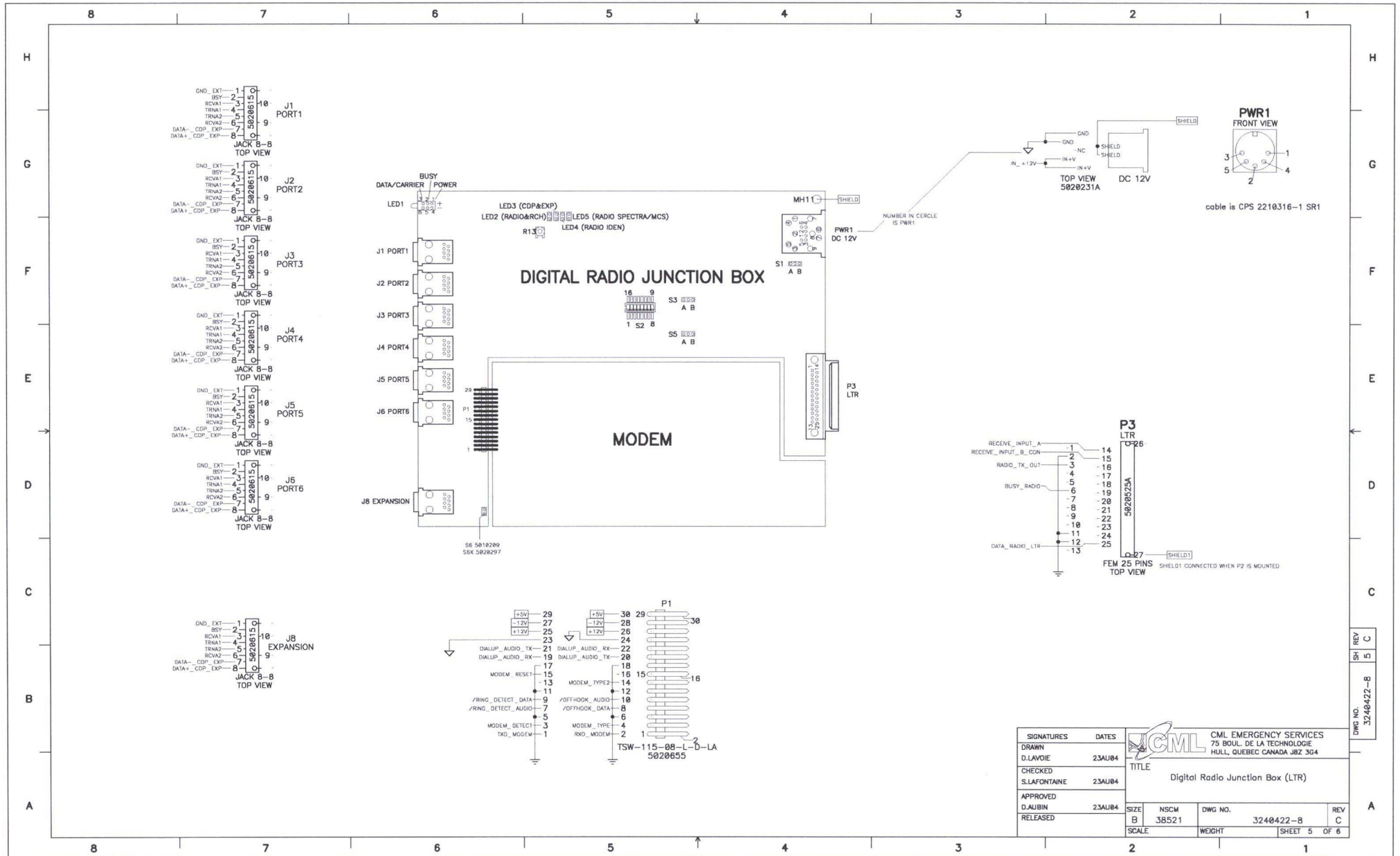


SIGNATURES	DATES		CML EMERGENCY SERVICES		
DRAWN			75 BOUL. DE LA TECHNOLOGIE		
D.LAVOIE	23AUG84		HULL, QUEBEC CANADA J8Z 3G4		
CHECKED			TITLE		
S.LAFONTAINE	23AUG84		Digital Radio Junction Box (LTR)		
APPROVED		SIZE	NSCM	DWG NO.	REV.
D.AUBIN	23AUG84	B	38521	3240422-8	
RELEASED		SCALE	WEIGHT	SHEET	OF

# Schematics — (3210760)

## CDM1550 series (LTR) Digital Junction Box Main Board (5 of 5)

4-12



SIGNATURES		DATES		CML EMERGENCY SERVICES	
DRAWN		23/04/84		75 BOUL. DE LA TECHNOLOGIE	
D.LAVOIE				HULL, QUEBEC CANADA J8Z 3G4	
CHECKED		23/04/84		TITLE	
S.LAFONTAINE				Digital Radio Junction Box (LTR)	
APPROVED		23/04/84		SIZE	
D.AUBIN				B NSCM	
RELEASED				SCALE	
				WEIGHT	
				SHEET 5 OF 6	

DWG NO. 3240422-B

REV C



# Appendix A

## Digital Junction Box Modem

### Regulatory Warnings

#### FCC Warning for Systems

This equipment complies with part 68 of the Federal Communications Commission (FCC) rules for the United States.

A label is located on the underside of the Digital Junction Box containing the FCC certification number and Ringer Equivalence Number (REN). You must, upon request provide the following information to your local telephone company:

**Certification #:** G6FALNANL3239 (for leased line modem)

**Certification #:** G6FAL07BL3208 (for dial-up modem)

**USOC Jack Type:** RJ11C/W

**AC REN:** 0.7B    **DC REN:** 0.7

Should you experience trouble with this telephone equipment, please contact:

Motorola Inc.  
System Support Center  
(800) 221-7144  
(847) 576-7300

The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company.

If trouble is experienced with this Digital Junction Box, for repair or warranty information, please contact the Motorola System Support Center at (800) 221-7144. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

This equipment cannot be used on public coin phone service provided by the telephone company. Connection to party line service is subject to state tariffs.

Your telephone company may discontinue your service if your equipment causes harm to the telephone network. They will notify you in advance of disconnection, if possible. During notification, you will be informed of your right to file a complaint to the FCC.

Occasionally, your telephone company may make changes in its facilities, equipment, operation, or procedures that could affect the operation of your equipment. If so, you will be given advance notice of the change to give you an opportunity to maintain uninterrupted service.

This equipment has two lines which are designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. See "Telephone Line Connections" on page A-7 of Appendix A for details. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of certified connector assembly (telephone extension cord).

## Equipment Attachment Limitations (Industry Canada)

**NOTICE:** The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations. Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

**Caution:** Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

**NOTICE:** The **Ringer Equivalence Number (REN)** assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5. **REN:** 0.3

## Restrictions concernant le raccordement de matériel (Industrie Canada)

**AVIS :** L'étiquette d'Industrie Canada identifie le matériel homologué. Cette étiquette certifie que le matériel est conforme à certaines normes de protection, d'exploitation et de sécurité des réseaux de télécommunications, comme le prescrivent les documents concernant les exigences techniques relatives au matériel terminal. Le Ministère n'assure toutefois pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit assurer qu'il est permis de le raccorder aux installations de l'entreprise locale de télécommunication. Le matériel doit également être installé en suivant une méthode acceptée de raccordement. L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions énoncées ci-dessus n'empêchent pas la dégradation du service dans certaines situations.

Les réparations de matériel homologué doivent être coordonnées par un représentant désigné par le fournisseur. L'entreprise de télécommunications peut demander à l'utilisateur de débrancher un appareil à la suite de réparations ou de modifications effectuées par l'utilisateur, ou à cause de mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit assurer que tous les fils de mise à la terre de la source d'énergie électrique, des lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, soient raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.



**Avertissement :** L'utilisateur ne doit pas tenter de faire ces raccordements lui-même; il doit avoir recours à un service d'inspection des installations électriques, ou à un électricien, selon le cas.

**AVIS : L'indice d'équivalence de la sonnerie (IES)** assigné à chaque dispositif terminal indique le nombre maximal de terminaux qui peuvent être raccordés à une interface. La terminaison d'une interface téléphonique peut consister en une combinaison de quelques dispositifs, à la seule condition que la somme d'indices d'équivalence de la sonnerie de tous les dispositifs n'excède pas 5. **IES:** 0.3

## Modem Installation

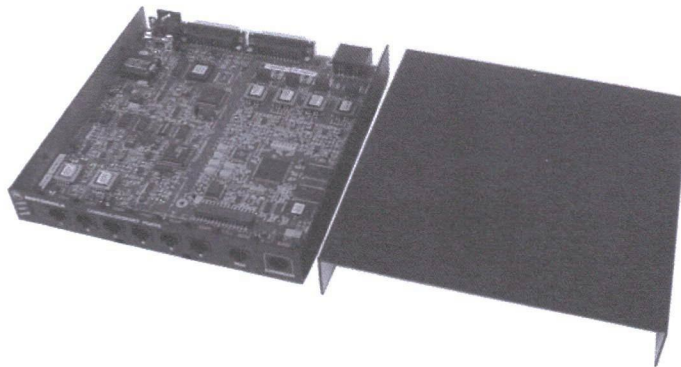
If the Digital Junction Box is located more than 50 ft from the digital radio, you need to establish a remote connection, using an internal modem and two telephone lines, to a second Digital Junction Box. The second Digital Junction Box, situated within 50 ft of the radio, connects locally to the radio. Both Digital Junction Boxes must be equipped with internal modems configured for the same type of audio and data telephone line connections.

If a Digital Junction Box does not come with an internal modem pre-installed, you must install the modem yourself. This requires opening the Digital Junction Box and inserting the modem in the proper location.

The modem that you install can be one of two different types, depending on the kind of telephone line connections you are using:

- Two-wire dial-up modem (DDN6660A).
- Two-/Four-wire dedicated leased line modem (DDN6659A).

**Note:** It is possible to configure the 4-wire leased line modem so that the audio and data telephone connections are 2-wire leased lines.



**Figure A-1: Digital Junction Box with Leased Line Modem Installed**

To install the modem, proceed as follows:

1. Turn off the power to the Digital Junction Box and unplug the power cord from the wall outlet.



2. Disconnect all cables from the Digital Junction Box and remove the ground screw at the back of the unit completely, along with the ground cable if there is one. For further information on the location of the ground screw and removing the cover, refer to Figure 2-10 and "Removing the Digital Junction Box Cover" on page 2-10.
3. Once the cover has been removed, hold the modem circuit board with the component side up and slide the modem's female connector P1 on to the main board's connector P1. The modem circuit board should fill up the vacant space and a connector for the audio and data cables should be at the back of the unit. Tighten the circuit board in place with screws at each stand post indicated by the large golden rings (MH1 to MH4) on either side of the two modem connectors P1 and J1.
4. Set switch 3 of the DIP switch (S2) to the modem option. If performing an 1100 Hz modem test, set switch 5 of the DIP switch (S2) to the ON position; otherwise leave it in the OFF position or return to the OFF position after testing. If the modem has jumpers, set accordingly. For further information, refer to the tables that follow.
5. Replace the cover, reconnect all the cables and the power.

## DIP Switch and Jumper Configuration and Potentiometer Settings

### DIP switch Settings

For DIP switch settings, refer to Table 2-1, “DIP Switch Settings,” on page 2-11

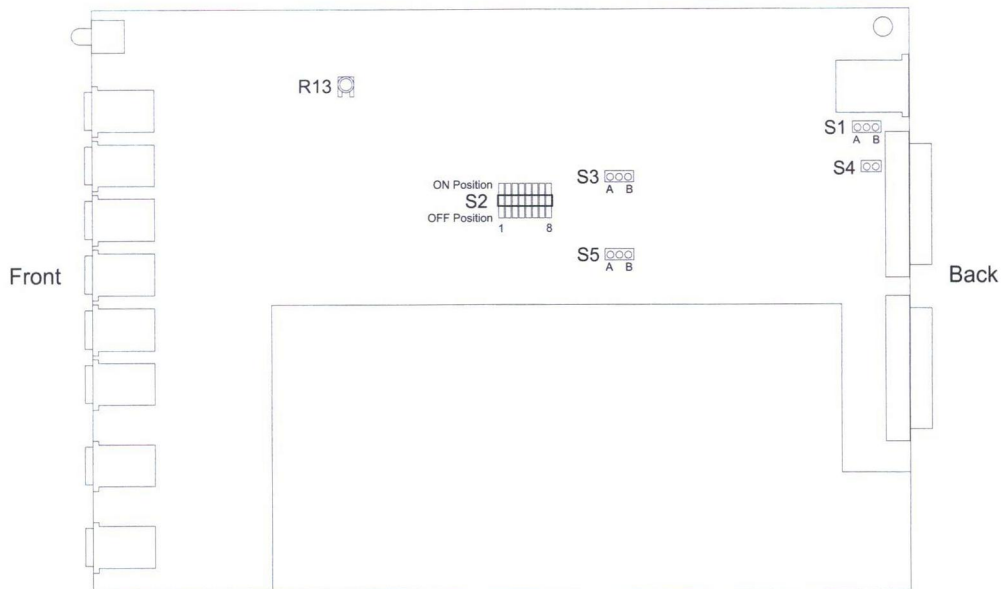


Figure A-2: Digital Junction Box DIP switch, jumper and potentiometer locations

### Two-wire Dial-up Modem Jumper Settings (DDN6660)

The two-wire dial-up modem does not have any jumpers to set.

### Two-/Four-wire Modem Jumper Settings (DDN6659)

The two-/four-wire model of internal modem has jumpers that allow you to configure the modem audio and data lines as two-wire lines or four-wire lines as required. Table A-1 lists jumper settings for the internal two-/four-wire modem, if one is installed. Consult Figure A-3 for jumper locations on the modem.

Table A-1: Two-/Four-wire modem jumper settings

Dedicated Leased Line Type		Jumper Settings			
		S1	S2	S3	S4
Data Line	2-wire	A in	A in		
	4-wire	B in	B in		
Audio Line	2-wire			A in	A in
	4-wire			B in	B in

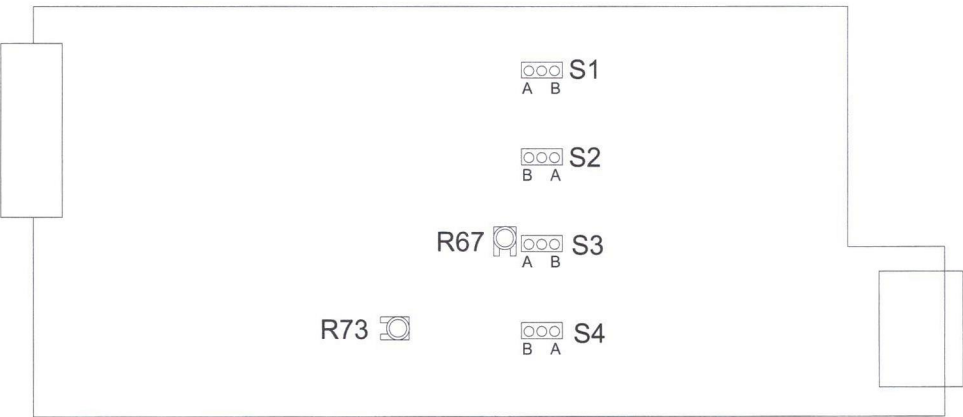


Figure A-3: Potentiometer and two-/four-wire leased line modem jumper locations

**Note:** When there are accessories (i.e., deskset or console) at both ends (local to and remote from the radio), all accessories must be set to four-wire, full duplex operation regardless of the setting of the Digital Junction Boxes. Otherwise the accessories are not able to communicate with each other. See the *CommandSTAR Lite System Database Manager Manual* for information on setting this radio channel feature for the Command-STAR Lite.



## Potentiometer Settings

For your interest, two potentiometers are used to adjust the audio: R67 for Rx and R73 for Tx. Adjust as shown:

- R67=adjust to midrange position (approx. 18.4K)
- R73=adjust to midrange position (approx. 25.4K)

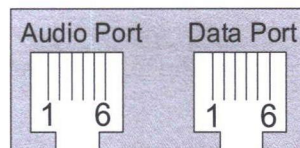
## Telephone Line Connections

If an internal modem is installed in the Digital Junction Box, you must make two telephone line connections to a second Digital Junction Box. One line is for data and the other is for audio. The line types can be 2-wire dial-up, or 2-wire or 4-wire dedicated leased.

Table A-2 identifies the signals corresponding to the RJ11 pins used for the audio and data telephone lines. Figure A-4 gives the pin-out for the RJ11 audio and data telephone line ports on the back of the Digital Junction Box.

**Table A-2: Signals on RJ11 data and audio telephone line pins**

RJ11 Pin	Data Telephone Line	Audio Telephone Line
1	Not used	Not used
2	Ring Data (4-wire)	Ring Audio (4-wire)
3	Ring Data (2-wire and 4-wire)	Ring Audio (2-wire and 4-wire)
4	Tip Data (2-wire and 4-wire)	Tip Audio (2-wire and 4-wire)
5	Tip Data (4-wire)	Tip Audio (4-wire)
6	Not used	Not used



**Figure A-4: Digital Junction Box RJ11 audio and data port pin-outs**

## Connecting 2-Wire Dial-Up Lines

To connect the 2-wire dial-up data and audio telephone lines:

1. Ensure that the Digital Junction Box DIP switch is set for the modem option.  
See "DIP switch Settings" on page A-5 for DIP switch configuration information.

2. Prepare two telephone cables, each with RJ11 connectors at both ends.  
See Table A-2 on page A-7 for the RJ11 connector pins used.
3. For the data telephone line:
  - a) Plug one end of one telephone cable into the Data Line RJ11 port on the back of the Digital Junction Box, as shown in Figure 2-7 on page 2-8 or Figure 2-8 on page 2-8.
  - b) Plug the other end of the cable into the Data telephone line jack.
4. For the audio telephone line:
  - a) Plug one end of the other telephone cable into the audio line RJ11 port on the back of the Digital Junction Box, as shown in Figure 2-7 on page 2-8 or Figure 2-8 on page 2-8.
  - b) Plug the other end of the cable into the audio telephone line jack.
5. Repeat Steps 1 to 4 for the Digital Junction Box located at the other end of the modem connection.

The 2-wire audio and data dial-up lines are connected.

### **Connecting 2-Wire and 4-Wire Dedicated Leased Lines**

To connect the 2-wire or 4-wire dedicated leased data and audio telephone lines:

1. Ensure that the Digital Junction Box DIP switch is set for the modem option.  
See "DIP switch Settings" on page A-5 for DIP switch configuration information.
2. Prepare two telephone cables, each with an RJ11 connector at one end.  
See Table A-2 on page A-7 for the RJ11 connector pins used.
3. For the data telephone line:
  - a) Plug the RJ11 end of one telephone cable into the data line RJ11 port on the back of the Digital Junction Box, as shown in Figure 2-7 on page 2-8 or Figure 2-8 on page 2-8.
  - b) Connect the other end of the cable to the leads for the data dedicated leased line.
4. For the audio telephone line:
  - a) Plug the RJ11 end of the other telephone cable into the audio line RJ11 port on the back of the Digital Junction Box, as shown in Figure 2-7 on page 2-8 or Figure 2-8 on page 2-8.
  - b) Connect the other end of the cable to the leads for the audio dedicated leased line.
5. Repeat Steps 1 to 4 for the Digital Junction Box located at the other end of the modem connection.

The 2-wire or 4-wire audio and data dedicated leased lines are connected.

## Modem Component Layout Diagram

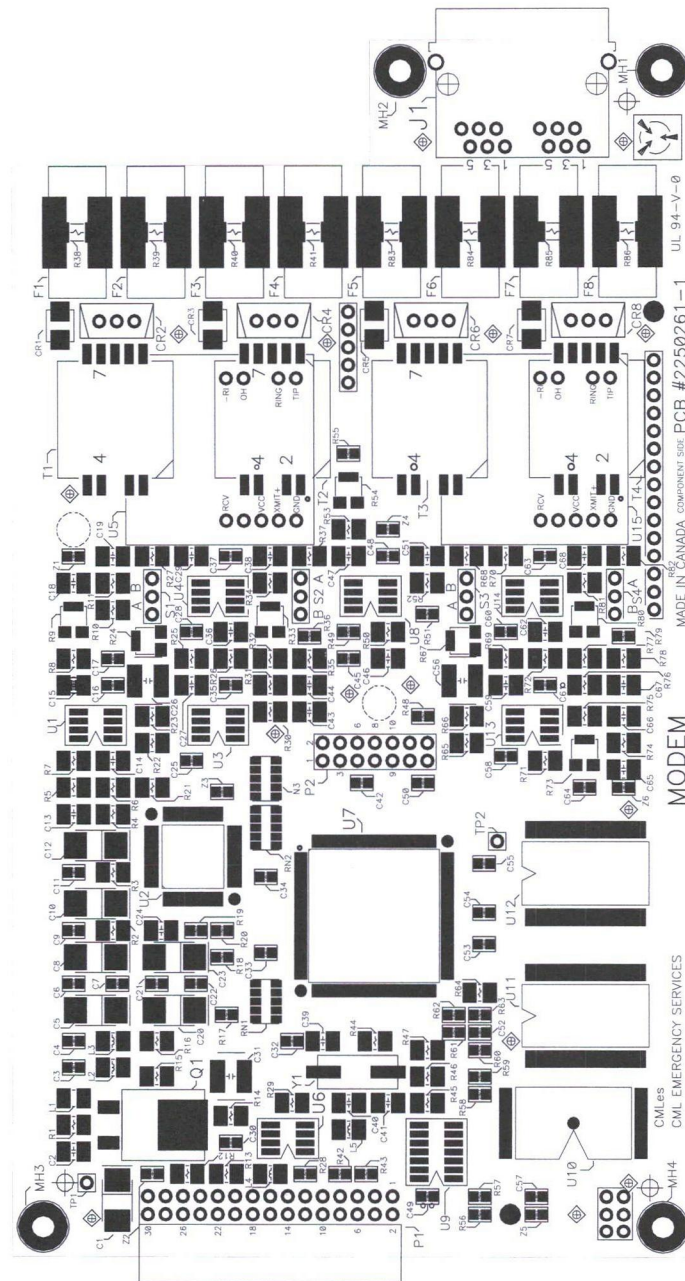
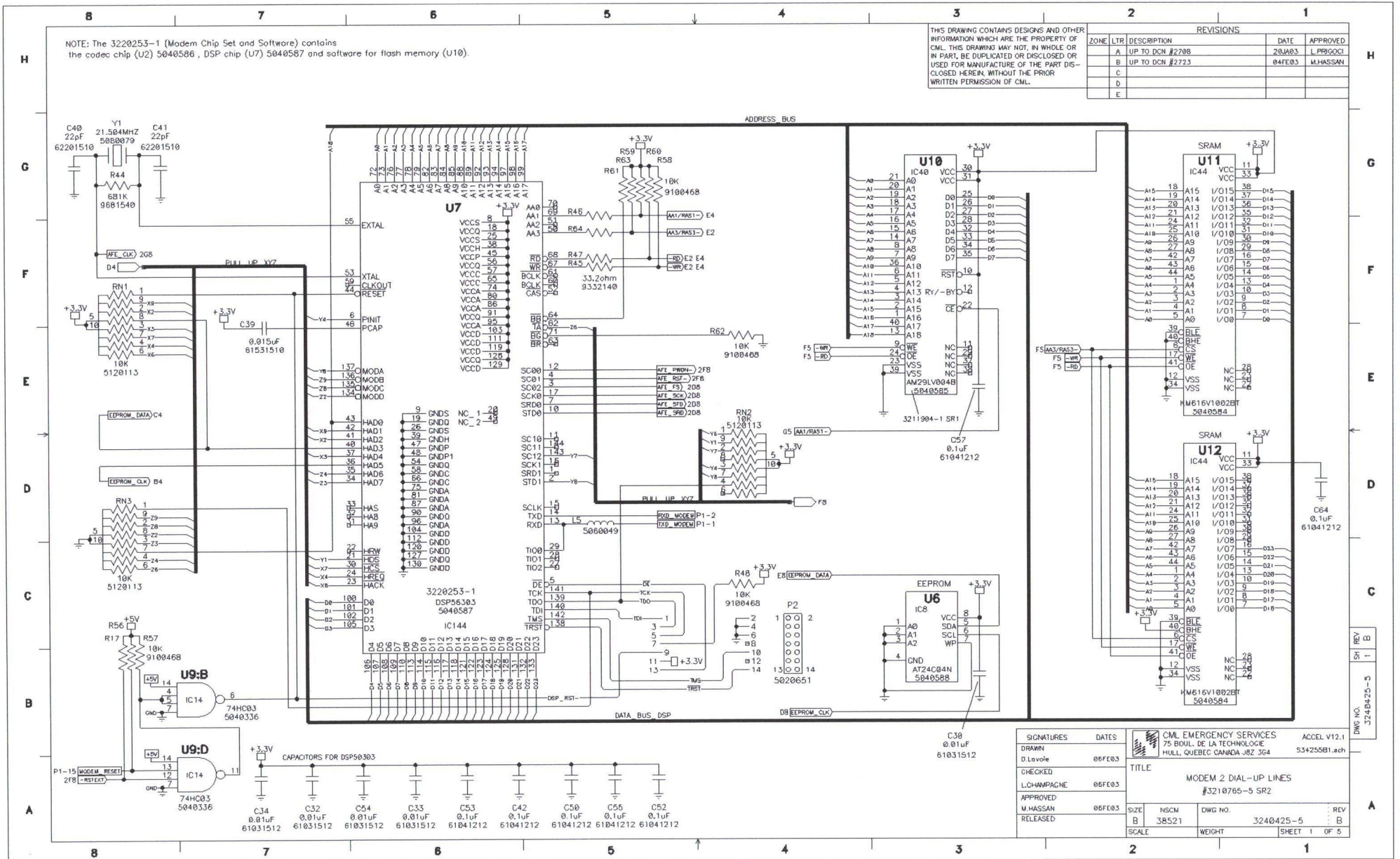


Figure A-5: Modem circuit board



# Schematics — (3210765) Two-wire Dial-up Modem (1 of 5)

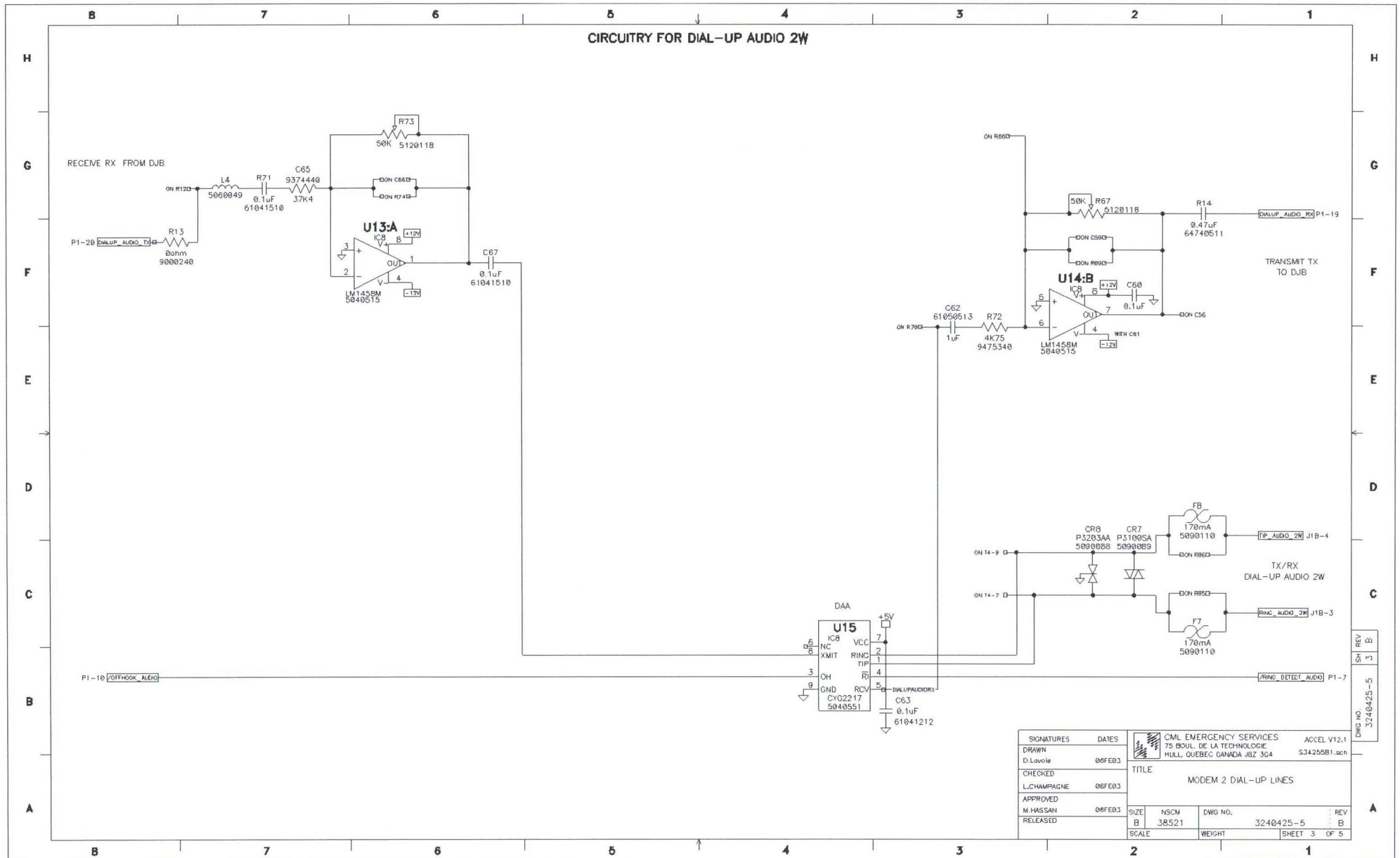
A-10





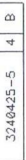
# Schematics — (3210765) Two-wire Dial-up Modem (3 of 5)

A-12

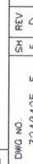




**A-13**

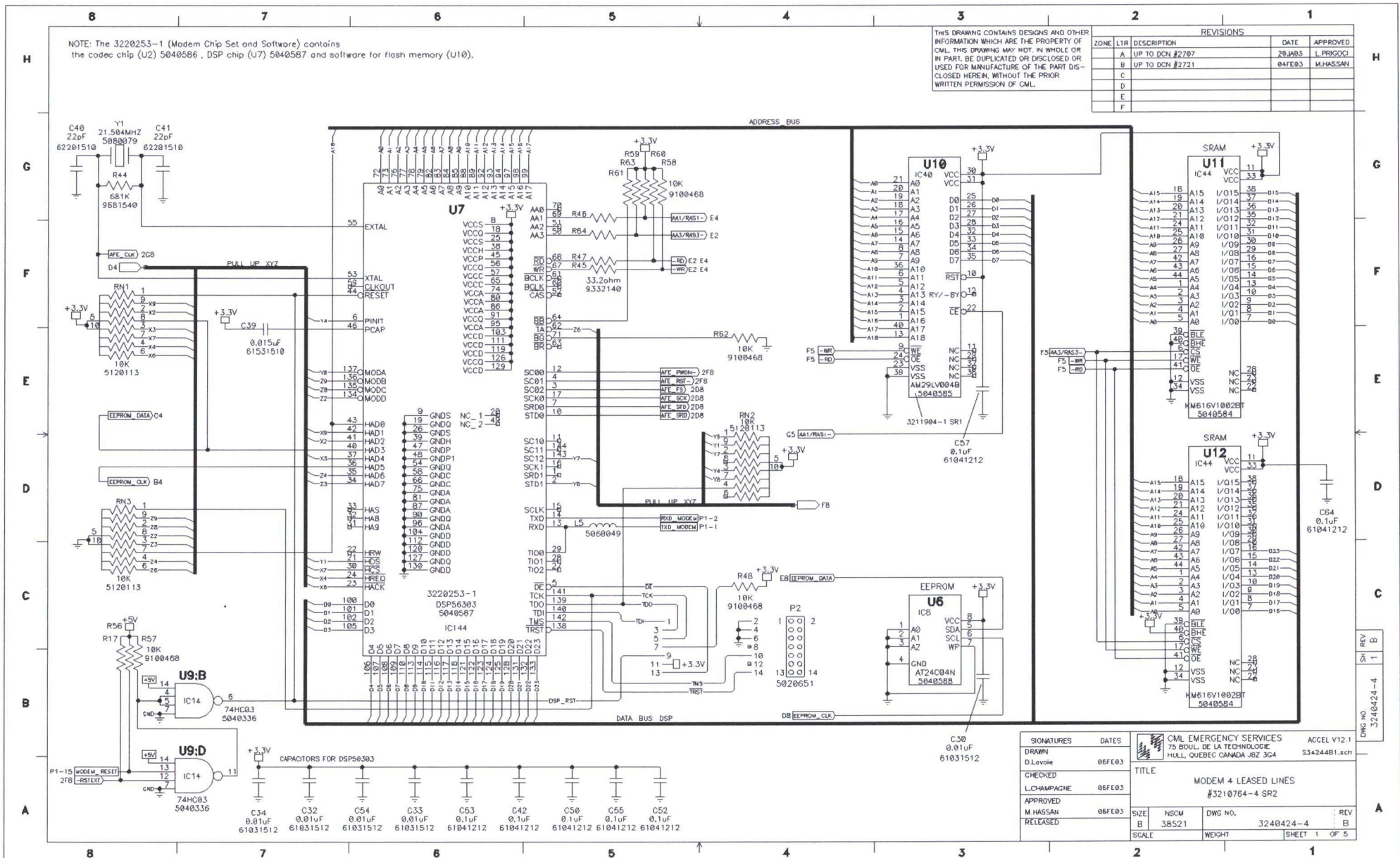


## A-14



## Two-/Four-wire Leased Line Modem (1 of 5)

**A-15**

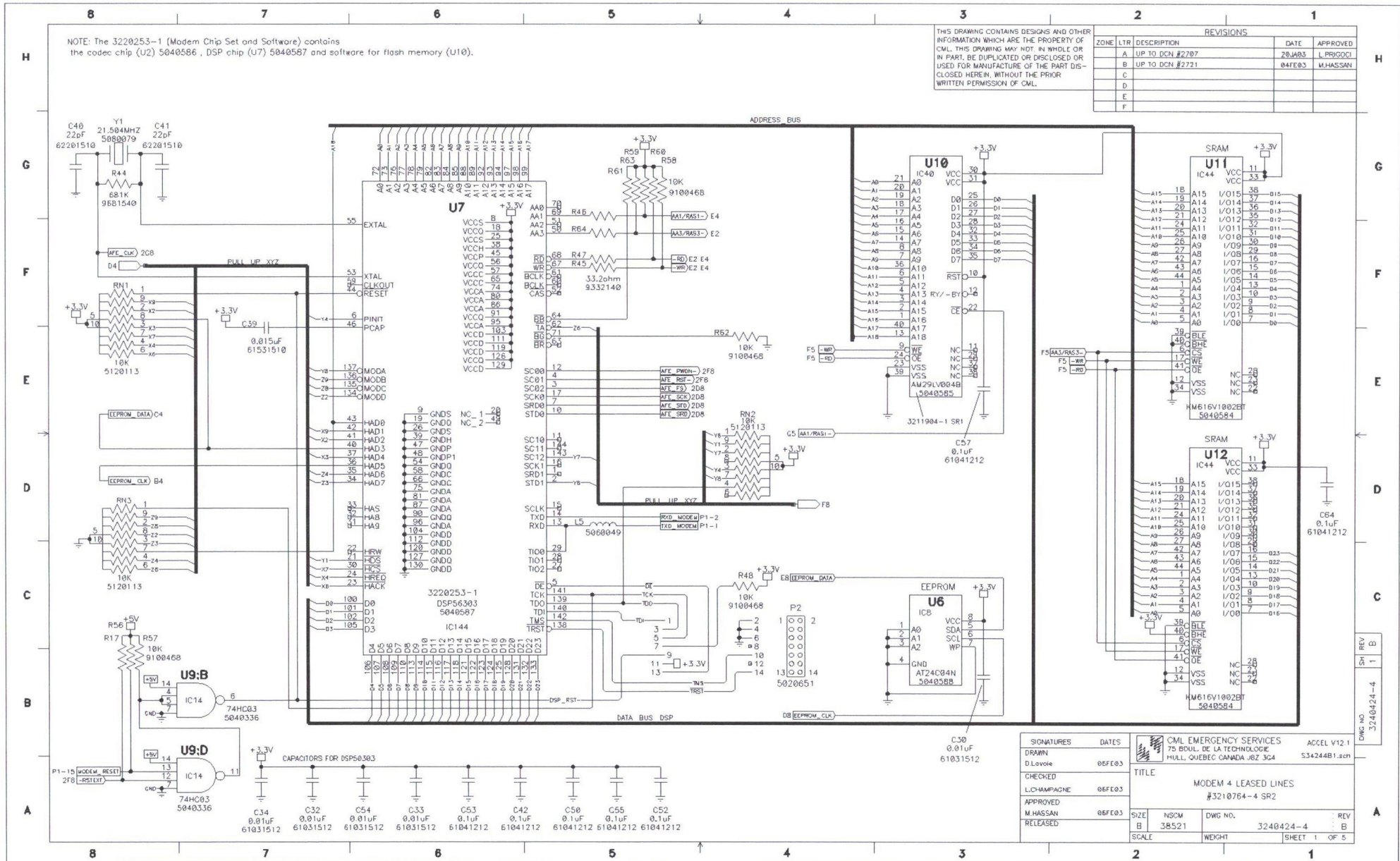




## Schematics — (3210764)

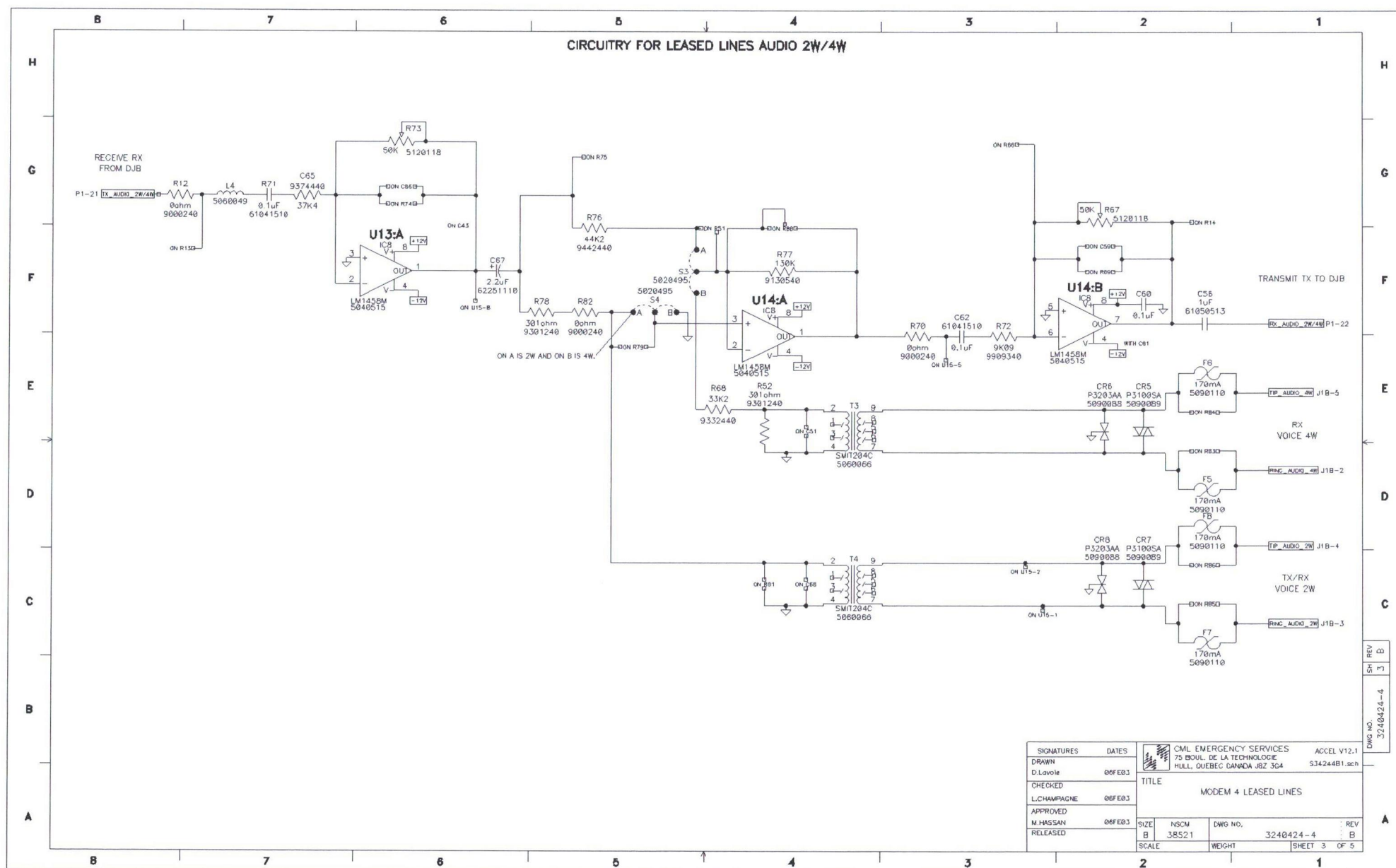
## Two-/Four-wire Leased Line Modem (2 of 5)

A-16



## Two-/Four-wire Leased Line Modem (3 of 5)

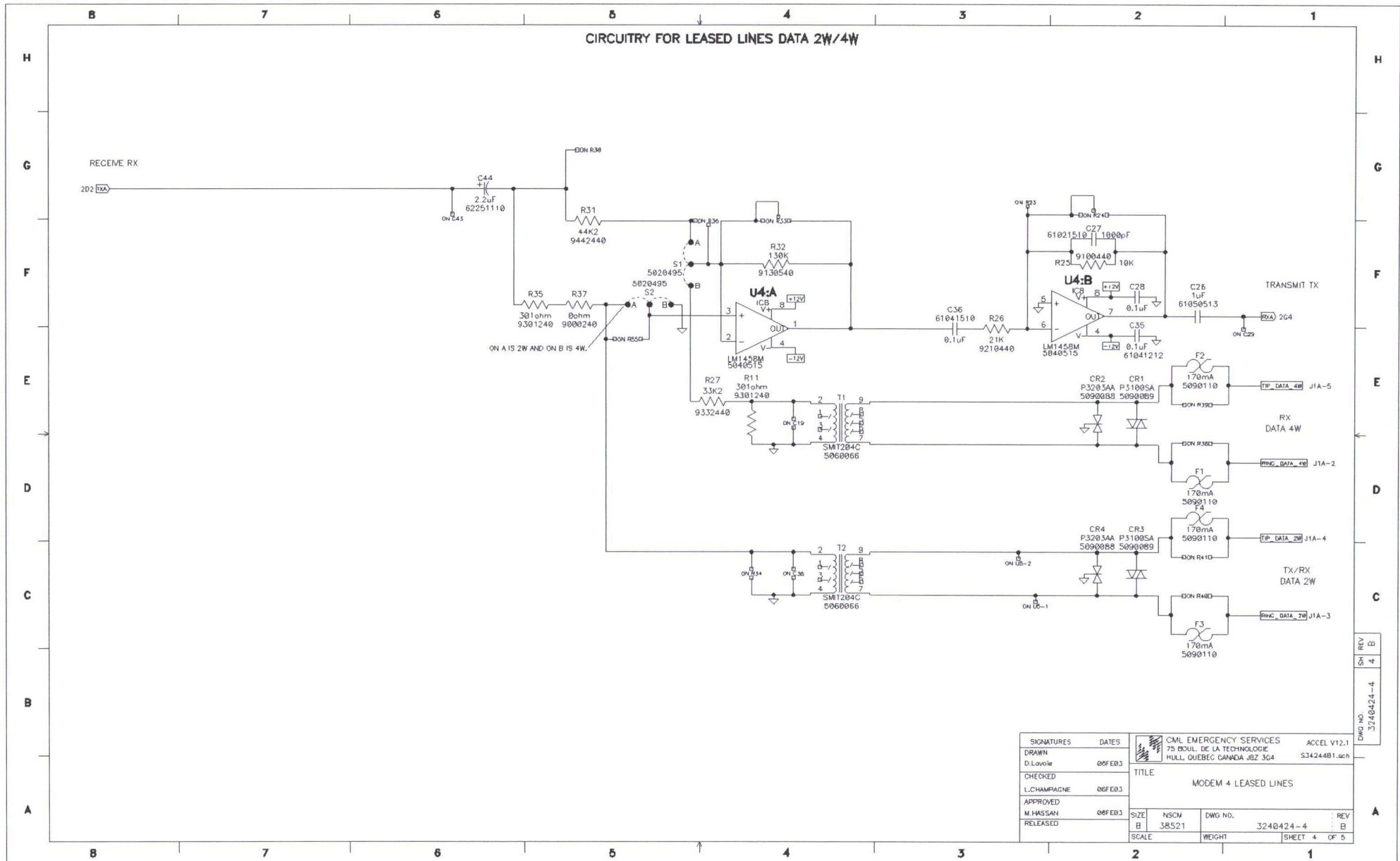
DWG NO.	SH	REV
3240424-4	3	B



# Schematics — (3210764)

## Two-/Four-wire Leased Line Modem (4 of 5)

A-18





## A-19



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